FOREWORD

This manual covers the explanation and service procedures of the TOYOTA FORKLIFT 5FGC/30 - 5FGC10, 13, 15 Series mounted with Daikin's torque converter. Please use this manual for providing quick, correct servicing of the corresponding forklift models, and also as the reference in sales and service activities.

As this manual is edited as a supplement to the repair manual for the 5FGC/30 - 5FGC10, 13, 15 Series, please refer to the existing repair manual (CE006) for the matters not covered herein.

This manual deals with the above models as of September 1992. Please understand that disagreement can take place between the descriptions in this manual and actual vehicles due to change in design and specifications. Any change or modification thereafter will be informed by Toyota Industrial Vehicles' Parts & Service News.

(Reference)

Repair manuals related to this manual are as follows:

- *TOYOTA INDUSTRIAL EQUIPMENT REPAIR MANUAL*
  5FGC/30 - 5FGC 10, 13, 15 (CE006)
- *TOYOTA INDUSTRIAL EQUIPMENT 4Y ENGINE REPAIR MANUAL (CE602)*
- *TOYOTA INDUSTRIAL EQUIPMENT 4P ENGINE REPAIR MANUAL (CE604)*

TOYOTA MOTOR CORPORATION

SECTION INDEX

NAME	SECTION
TORQUE CONVERTER (DAIKIN)	0
APPENDIX	1

TORQUE CONVERTER (DAIKIN)

0

	Page
GENERAL	0-2
HYDRAULIC CIRCUIT DIAGRAM	0-3
OIL CIRCULATION PATH	0-4
POWER TRANSMISSION LINE	0-4
SPECIFICATIONS	0-5
COMPONENTS	0-6
TROUBLESHOOTING	0-11
TORQUE CONVERTER ASSY	0-16
REMOVAL·INSTALLATION	0-16
DISASSEMBLY·INSPECTION·REASSEMBLY	0-18
TORQUE CONVERTER	0-21
OIL PUMP	0-22
DISASSEMBLY·INSPECTION·REASSEMBLY	0-23
CLUTCH	0-25
DISASSEMBLY·INSPECTION·REASSEMBLY	0-26
CONTROL VALVE	0-33
DISASSEMBLY·INSPECTION·REASSEMBLY	0-34
OIL PRESSURE MEASUREMENT	0-37
STALL TEST	0-38

GENERAL

The torque converter manufactured by Daikin Manufacturing Co., Ltd. is adopted in place of the one manufactured by Okamura Corporation.
The features are as follows:

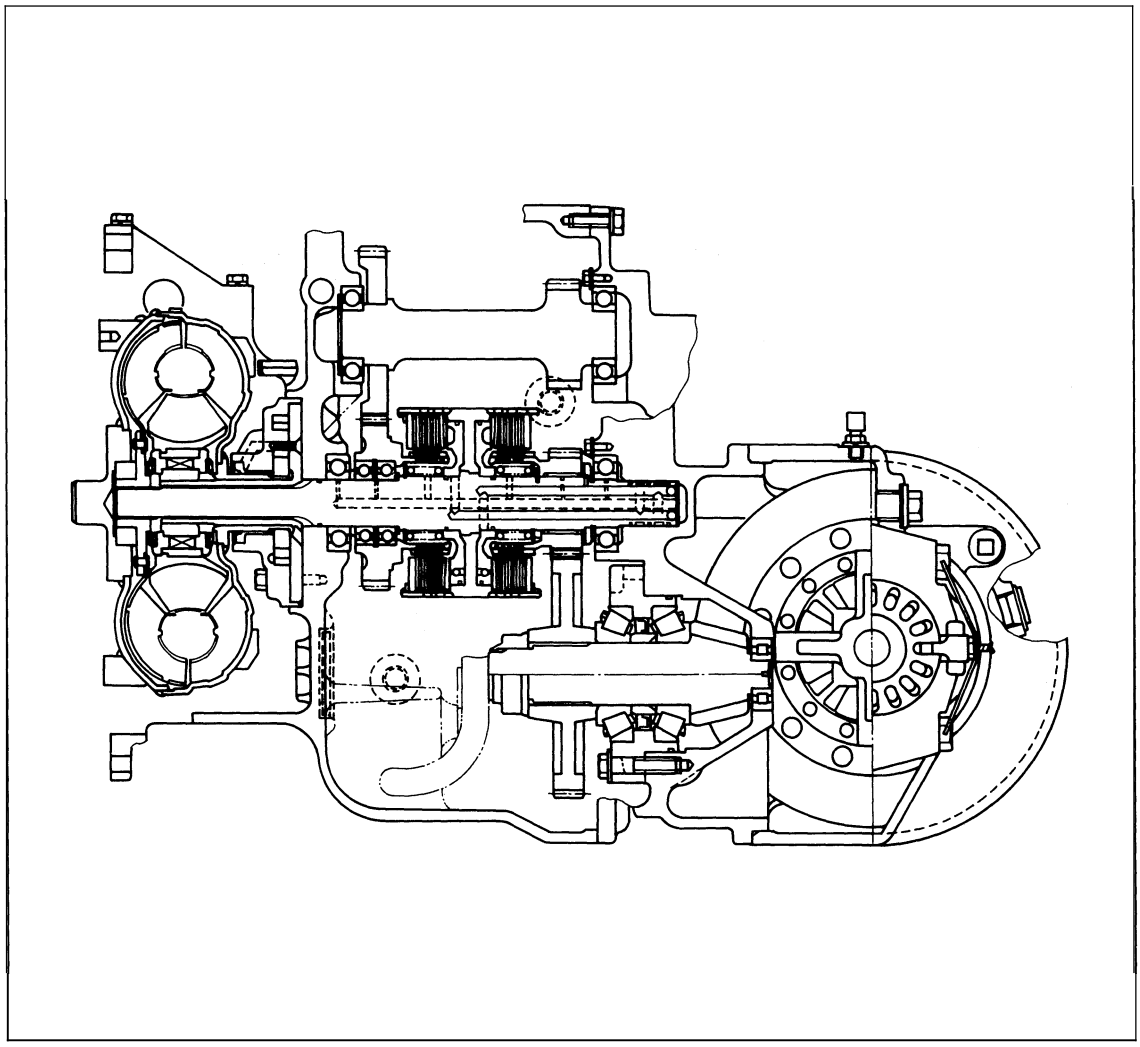
1. The torque converter is a highly efficient round integrally welded type made of sheet metal

2. The oil pump is an internal gear pump with pipes built in the housing to eliminate external piping

3. The transmission is a power shift transmission for one forward and one reverse traveling speeds

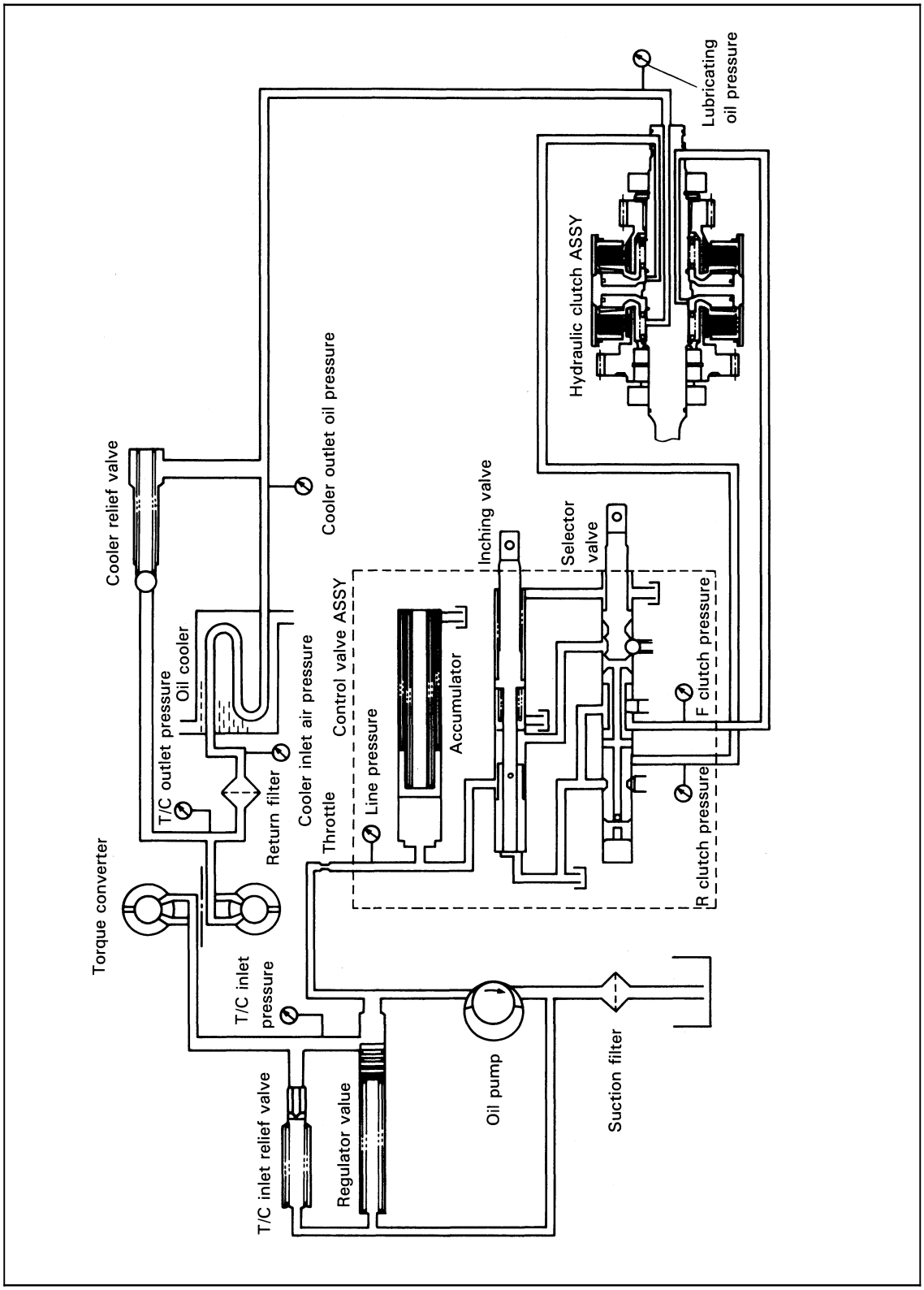
4. The clutch is a multi-plate disc clutch in compact size by adoption of beam welding. Non-asbestos clutch discs are adopted for improving the feeling and durability.

5. A spool type change valve with built in modulation and inching mechanisms for one forward and one reverse traveling speeds is adopted as the control valve to improve the operability and to reduce the time lag and shock at the time of starting and shifting.



Torque Converter Sectional View

HYDRAULIC CIRCUIT DIAGRAM



Torque Converter Hydraulic Circuit Diagram

OIL CIRCULATING PATH (Refer to the hydraulic circuit.)

1. When the engine starts, the oil pump is driven by the flat portion. the oil in the transmission case flows through the oil strainer into the oil pump for forced feeding.

2. The oil discharged from the oil pump enters the regulator valve on one side of the housing. The clutch pressure is regulated to 980 kPa (10 kg/cm^2) [140 psi] to 1370 kPa (14 kg/cm^2) [200 psil 12000 rpm at 80°C (176°F)].

3. The oil after pressure regulation by the regulator valve enters the control valve on top of the transmission case and is then led to each hydraulic clutch according to the shift lever operation. An accumulator is provided on the way.
When the shift lever position is changed, the oil in the accumulator is supplied to the hydraulic clutch.

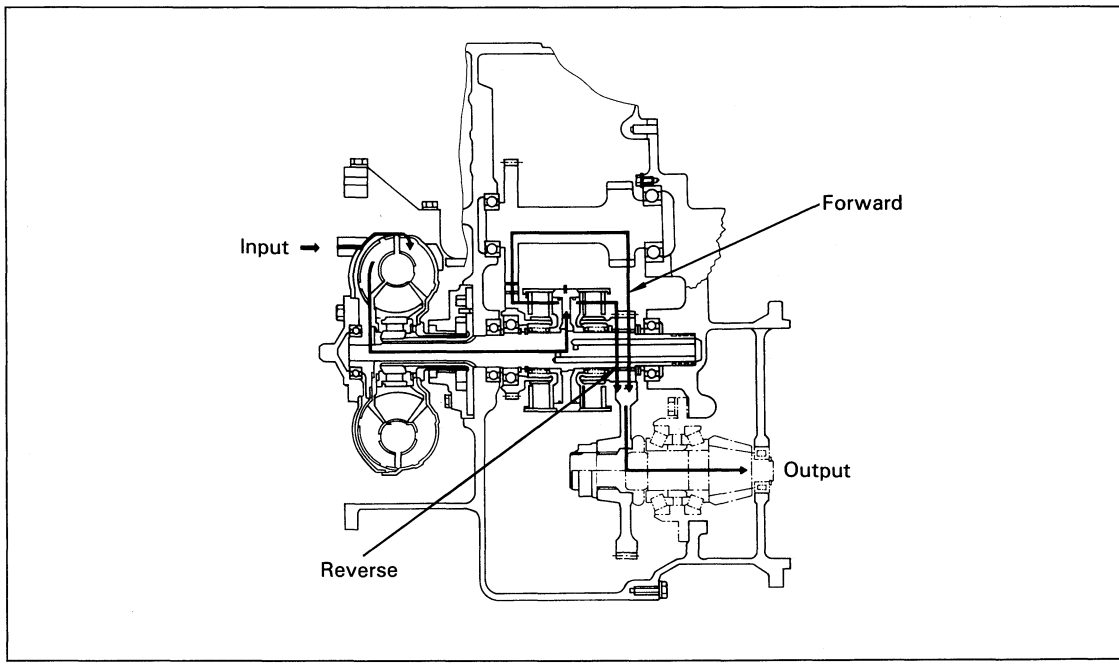
4. The oil quantity in the accumulator is almost equal to the necessary quantity for clutch operation. After clutch operation, therefore, the oil on the hydraulic circuit side gradually enters the accumulator to raise the pressure in the clutch gradually for smooth clutch application.

5. The oil discharged from the regulator valve, on the other hand, flows through the torque converter inlet relief valve (set at max. 690 kPa (7 kglcm^2) [100 psi]) built in the housing into the torque converter.

6. The oil discharged from the torque converter is subject to pressure regulation by the cooler relief valve built in the housing and flows into the oil cooler, with the cooler inlet pressure set at max. 343 kPa (3.5 kg/cm^2) I50 psil.

7. The oil cooled by the oil cooler and the oil relieved from the relief valve converge to flow into the transmission case. It cools or lubricates each disc bearing of the hydraulic clutch and returns to the oil tank in the transmission case.

POWER TRANSMISSION LINE



Torque Converter & Transmission Power Line

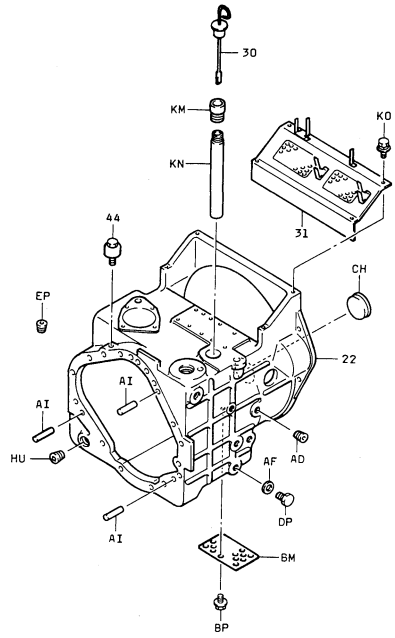
SPECIFICATIONS

Item		5FGC10, 13, 15	30-5FGC10, 13, 15
Manufacturer		Daikin Manufacturing Co., Ltd.	←
Type		3-element, single stage, 2-phase	←
Stall torque ratio		2.8	3.1
Stall speed rpm		1800 – 2050	2050 – 2300
Gear ratio	Forward	2.120	2.391
	Reverse	2.120	2.391
Speed selection method		Hydraulic pressure	←
Torque converter inlet pressure kPa (kg/cm²) [psi]	At 700 rpm	147 – 290 (1.5 ~ 3) [21 – 401	←
	At 2000 rpm	390 – 690 (4 – 7) [60 – 1001	←
Torque converter outlet pressure kPa (kg/cm²) [psi]	At 700 rpm	100 – 200 (1 – 2) [10 – 301	←
	At 2000 rpm	245 – 343 (2.5 – 3.5) [36 – 521	←
Clutch operating pressure kPa (kg/cm²) [psi]	At 700 rpm	880 (9) [130] or above	←
	At 2000 rpm	980 – 1370 (10 – 14) [140 – 2001	←
Lubricating pressure kPa (kg/cm²) [psi]	At 700 rpm	29 (0.3) [4.3]	←
	At 2000 rpm	100 – 245 (1 – 2.5) [10 – 361	←
Oil quantity ℓ (US gal)		8.4 – 9.6 (2.22 – 2.53)	←
Oil type		Castle Auto-Fluid DII	←
Connected engine		4Y	4P

Note:
The torque converter oil pressures are measured when the oil temperature is 80°C (176°F).

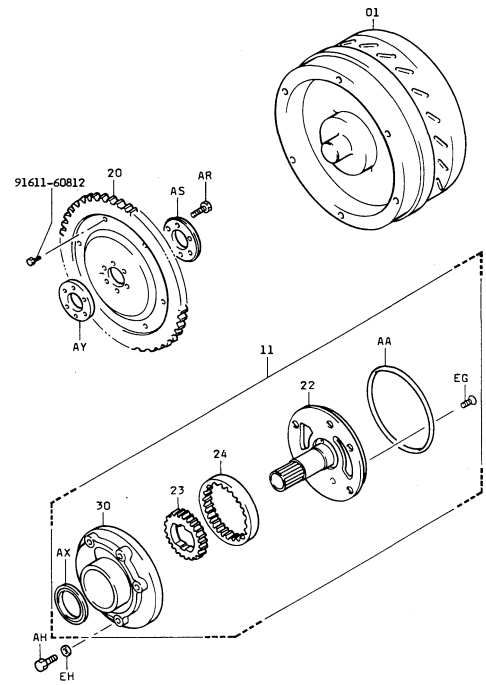
COMPONENTS

3201



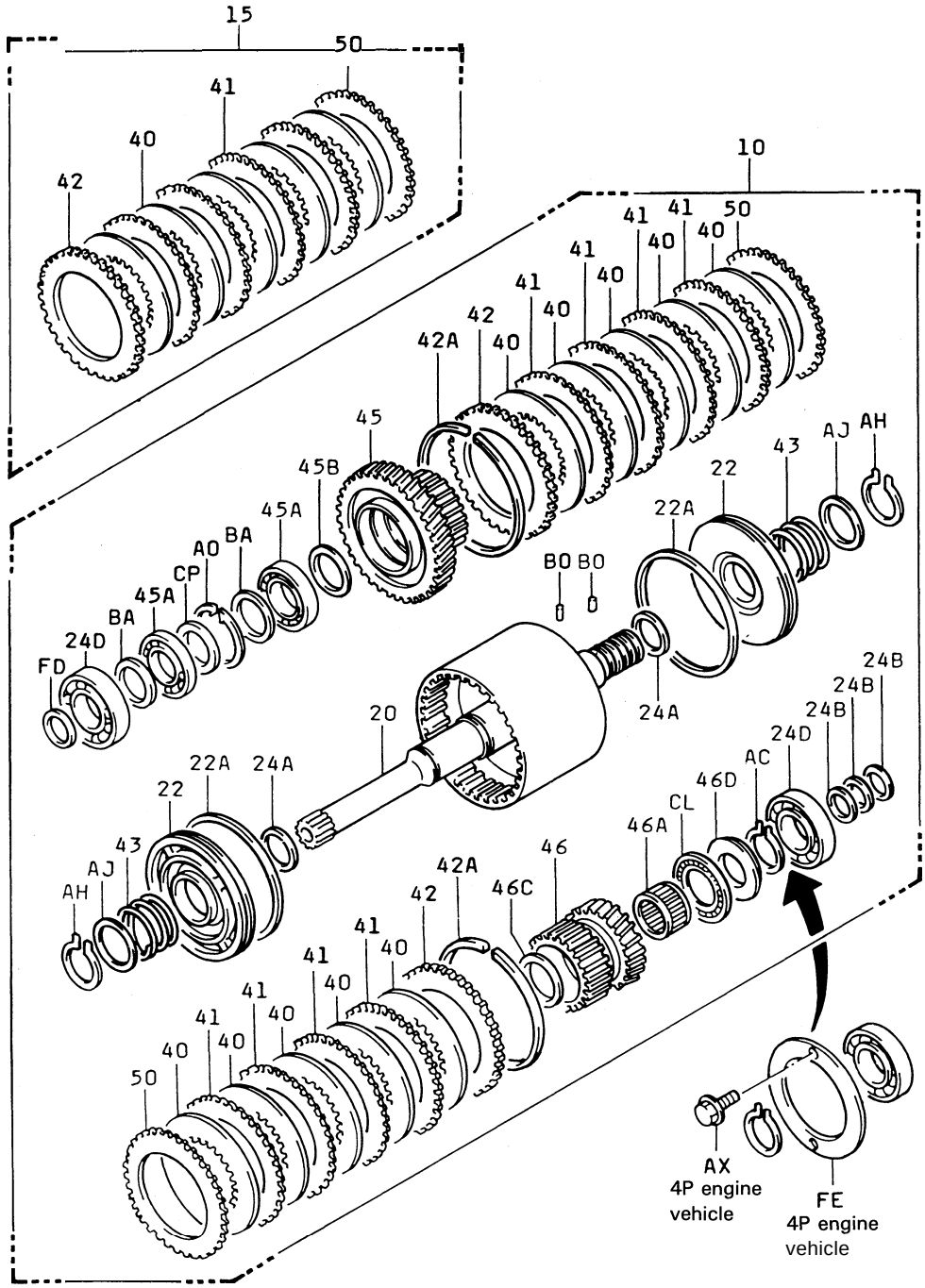
Torque Converter Housing Components

3202



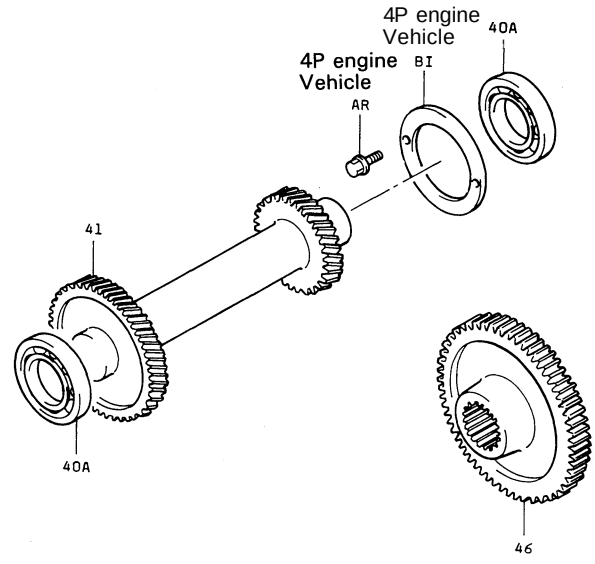
Torque Converter Components

3203



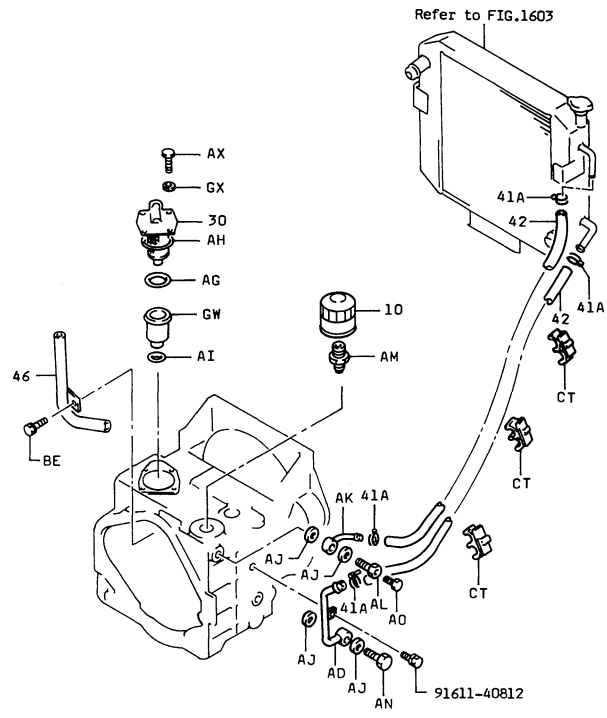
Torque Converter Clutch Components

3204



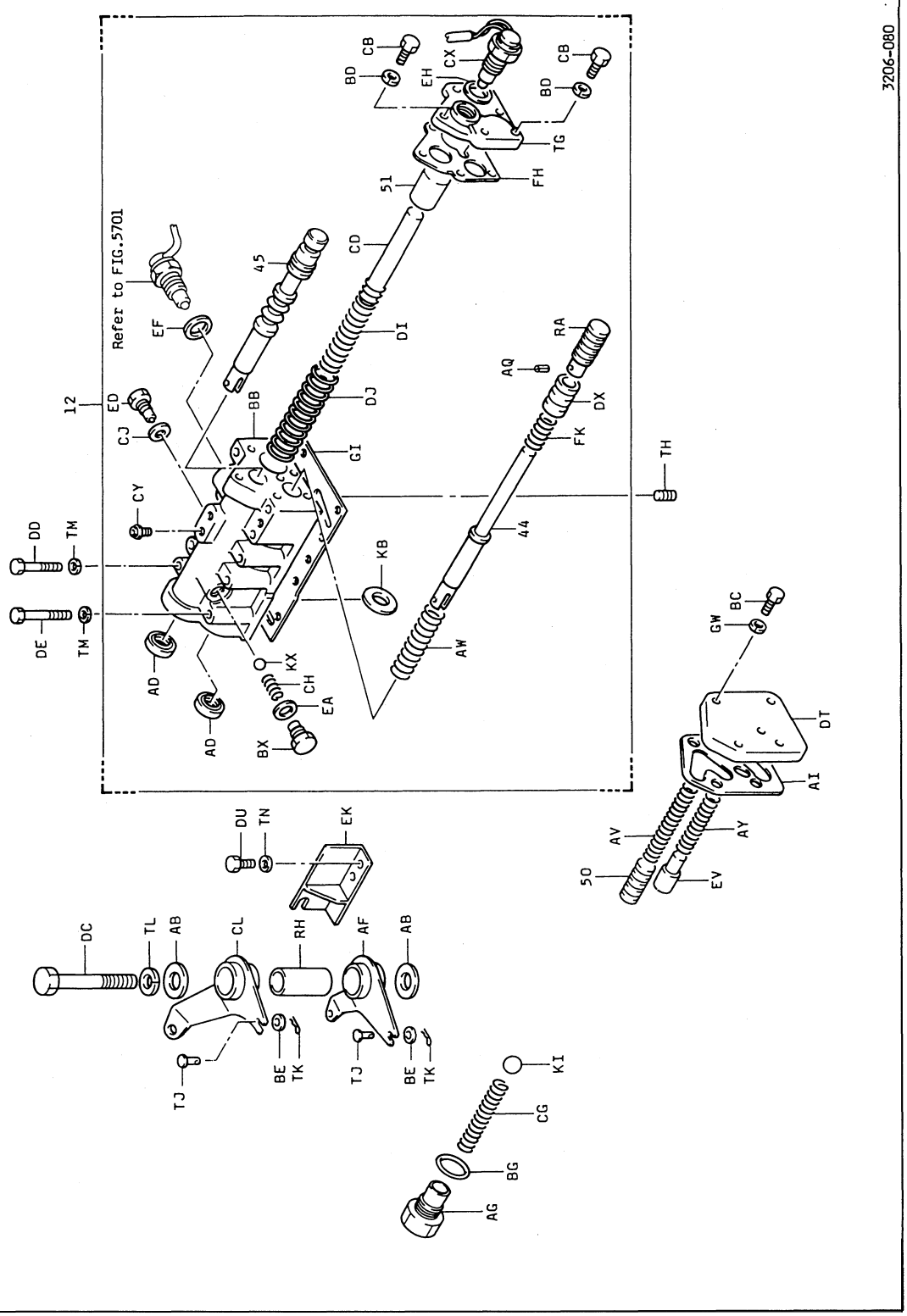
Torque Converter Gear Components

3213

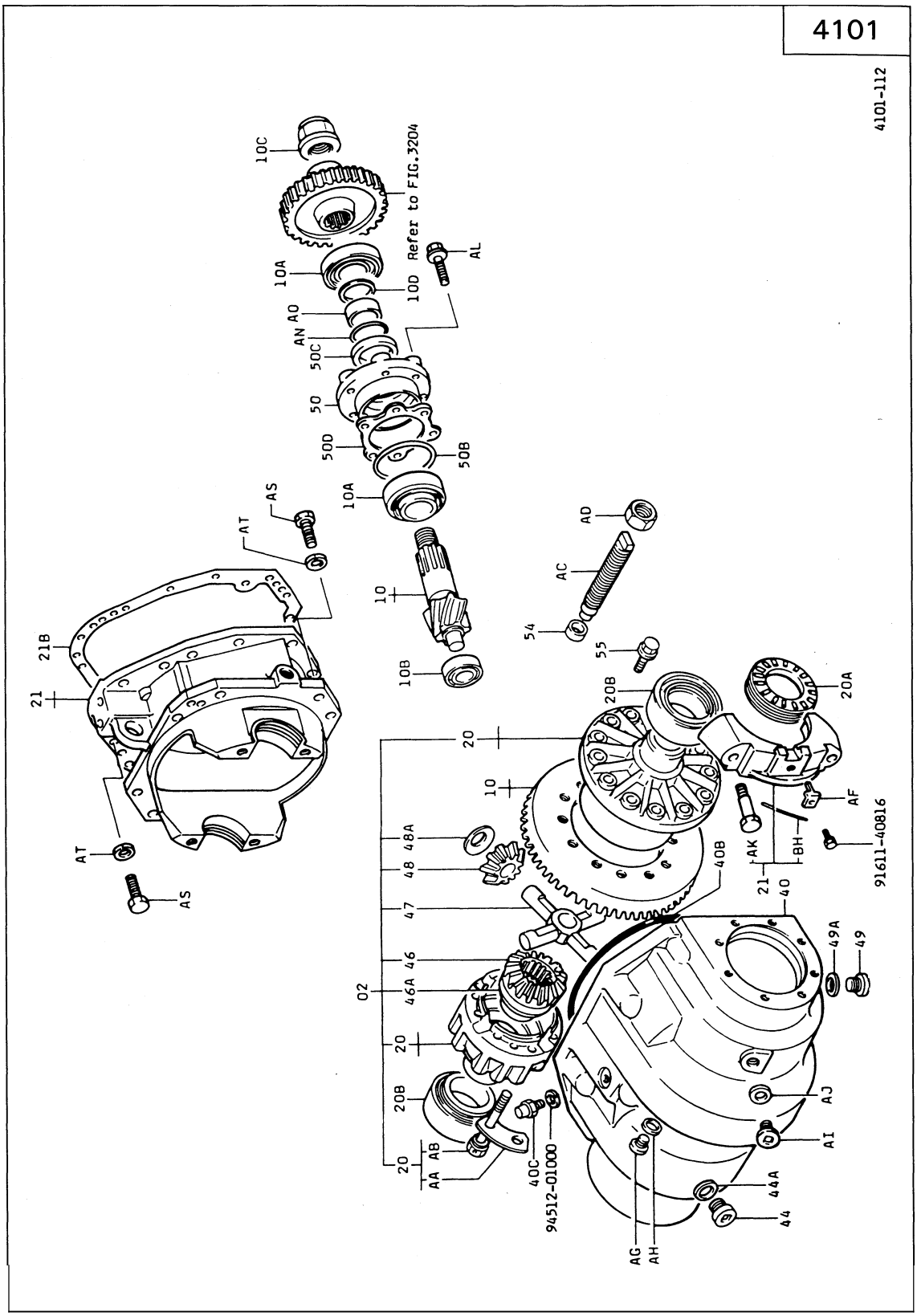


Torque Converter Piping Components

3206



Control Valve Components



Differential Components

TROUBLESHOOTING

Trouble status	Cause	Remedial Action
The power is not transmitted.	1 No oil pressure	Oil pressure measurement and stall test
	1) Insufficient oil level	• Oil addition
	2) Damaged oil pump or drive part	• Disassembly → inspection → parts replacement
	3) Damaged piston or broken spring in torque converter inlet relief valve or regulator valve	• Disassembly → inspection → parts replacement
	4) Malfunction by worn or damaged control valve spool or foreign matter trapping	• Disassembly → inspection → parts replacement
	5) Worn or damaged clutch shift sealing	• Disassembly → inspection → parts replacement
	6) Malfunction by worn clutch piston sealing or foreign matter trapping	• Disassembly → inspection → parts replacement
	2. Mechanical Damage	
	1) Damaged drive plate	• Disassembly → inspection → parts replacement
	2) Broken shaft or gear	• Disassembly → inspection → parts replacement
	3) Damaged spline	• Disassembly → inspection → parts replacement
	4) Damaged clutch drum	• Disassembly → inspection → parts replacement
	5) Damaged snap ring at clutch drum	• Disassembly → inspection → parts replacement
	6) Damaged clutch plate	• Disassembly → inspection → parts replacement
	7) Damaged clutch disc	• Disassembly → inspection → parts replacement
	8) Sticking of plates	• Disassembly → inspection → parts replacement
Lowered output	1. Low oil pressure	Oil pressure measurement and stall test
	1) Insufficient oil quantity	• Oil supply
	2) Air entrance in suction side	• Gasket inspection → parts replacement
	3) Clogged strainer	• Disassembly → inspection → cleaning or parts replacement
	4) Lowered oil pump efficiency	• Disassembly → inspection → cleaning or parts replacement
	5) Fatigue of regulator valve spring or piston malfunction	• Disassembly → inspection → parts replacement

Trouble status	Cause	Remedial Action
Lowered output	61 Fatigue of spring of torque converter inlet relief valve or piston malfunction	• Dsassembly → inspection → parts replacement
	71 Worn or damaged seal ring	• Disassembly → inspection → parts replacement
	8) Malfunction by damaged selector valve or inching valve in the control valve or foreign matter trapping	• Disassembly → inspection → parts replacement
	9) Malfunction by worn clutch piston seal ring or foreign matter trapping	• Disassembly → inspection → parts replacement
	2. Mechanical Damage	
	1) Damaged or deformed impeller	• Parts replacement
	2) Deformed clutch drum	• Disassembly → inspection → parts replacement
	31 Burnt clutch disc	• Disassembly → inspection → parts replacement
	41 Deformed clutch plate	• Disassembly → inspection → parts replacement
	51 One way clutch slipping	• Parts replacement
	3. Other	
	11 Use of improper oil (other than the specified type)	• Replacement with specified oil → clutch disc replacement as required
Abnormal oil temperature rise	1) Improper oil level	• Oil addition or reduction
	2) Contact of impeller	• Parts replacement
	3) Worn or seizure of bearing	• Disassembly → inspection → parts replacement
	4) Dragging by deformed clutch disc or clutch plate	• Disassembly → Inspection → parts replacement
	5) Malfunction of oil cooler	• Disassembly → inspection → parts replacement
	61 Clutch slipping and lowered efficiency by use of improper oil (other than the specified type)	• Replacement with specified oil → clutch disc replacement as required
	7) Worn or damaged oil pump	• Disassembly → inspection → parts replacement

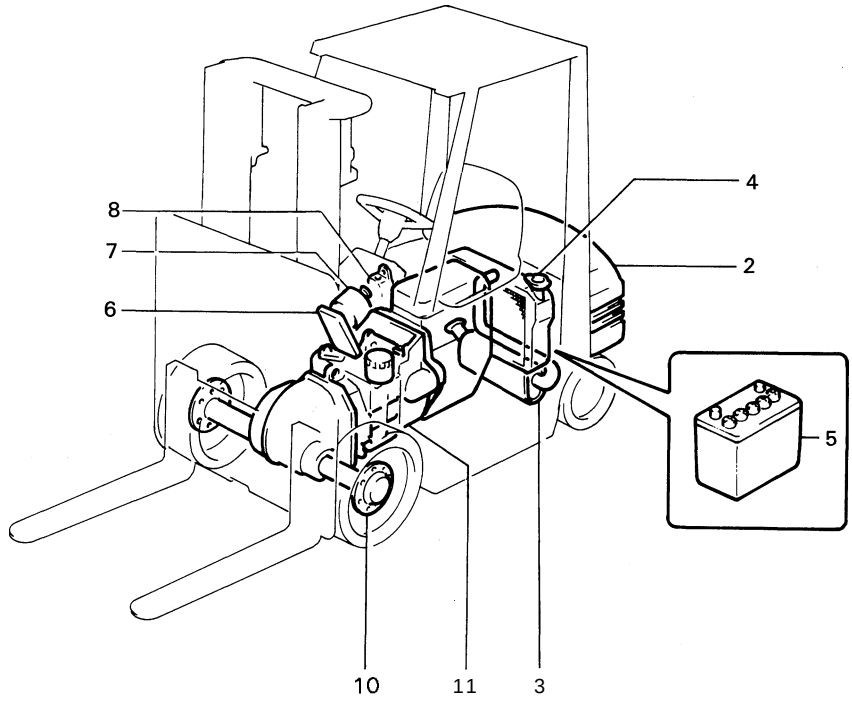
Trouble status	Cause	Remedial Action
Abnormal sound generation	1) Insufficient oil level or generation of cavitation by air entrance from the suction side	• Oil addition
	2) Damaged oil pump	• Disassembly → inspection → parts replacement
	3) Contact of deformed impeller	• Parts replacement
	4) Damaged drive plate	• Disassembly → inspection → parts replacement
	5) Damaged gear	• Disassembly → inspection → parts replacement
	6) Worn or damaged bearing	• Disassembly → inspection → parts replacement
	7) Worn spline	• Disassembly → inspection → parts replacement
	8) Wear at contact faces of clutch drum and clutch plate	• Disassembly → inspection → parts replacement
	9) Loosened bolt	• Bolt retightening
	10)Clutch slipping by lowered oil temperature	• Oil pressure inspection
	11)Generation of cavitation caused by clogged suction filter	• Disassembly → inspection → parts replacement
Oil oozing or leaking	1. Oil seal portion	
	1) Worn or damaged lip	• Disassembly → inspection → parts replacement
	2) Foreign matter (dust) trapping	• Disassembly → inspection → parts replacement
	3) Worn or damaged shaft	• Disassembly → inspection → parts replacement
	4) Hardened or fatigued rubber by abnormal oil temperature rise	• Disassembly → inspection → parts replacement
	2. O-ring	
	1) Damaged O-ring	• Disassembly → inspection → parts replacement
	2) Scratch on mating face	• Disassembly → inspection → parts replacement
	3) Hardened or fatigued rubber by abnormal temperature rise	• Disassembly → inspection → parts replacement
	4) Sudden use at very low temperature (—15°C) [5°F]	• Warming up

Trouble status	Cause	Remedial Action
Oil oozing or leaking	3. Joint faces with gasket in-between	
	1) Loosened bolts	• Retightening
	2) Damaged gasket	• Disassembly → inspection → reassembly
	3) Surface defect on mating face	• Disassembly → inspection → reassembly
	4. Plugs and threaded portions	
	1) Loosened bolt(s)	• Retightening
	2) Broken bolt(s)	• Disassembly → inspection → reassembly
	3) Crack in internal thread	• Disassembly → inspection → reassembly
	4) Defective sealing material (including tape)	• Sealing material recoating
Drag torque generation	1) Deformed clutch disc or drive plate	• Disassembly → inspection → reassembly
	2) Fatigued or broken clutch return spring	• Disassembly → inspection → reassembly
	3) Clutch gear bearing seizure	• Disassembly → inspection → reassembly
	4) Clutch piston malfunction by foreign matter trapping	• Disassembly → inspection → reassembly
	5) Worn selector valve in control valve	• Disassembly → inspection → reassembly
	6) Clogged drain circuit in control valve	• Disassembly → inspection → reassembly
	7) Staged wear of clutch drum spline	• Disassembly → inspection → reassembly
	8) Clogged clutch piston check valve	• Disassembly → inspection → reassembly
Slow clutch application	1) Worn clutch disc or clutch plate	• Disassembly → inspection → parts replacement
	2) Increased oil leak due to worn or damaged clutch seal ring	• Disassembly → inspection → parts replacement
	3) Broken spring or piston malfunction in regulator valve	• Disassembly → inspection → parts replacement

Trouble status	Cause	Remedial Action
Slow clutch application	4) Clogged oil path in control valve	• Disassembly → inspection → parts replacement
	5) Malfunction of selector valve or inching valve	• Disassembly → inspection → parts replacement
Shock generation	1) Fatigued or broken accumulation spring	• Disassembly → inspection → parts replacement
	2) Malfunction of accumulator piston	• Disassembly → inspection → parts replacement
	3) Fatigued or damaged camber plate	• Disassembly → inspection → parts replacement
	4) Insufficient clutch off margin	• Clutch drum adjustment to the standard value

TORQUE CONVERTER ASSY

REMOVAL-INSTALLATION



1 Cooling water and differential oil
9 Electrical wiring, etc.
12 Torque converter oil
13 Torque converter **ASSY** disconnection

Torque converter **ASSY** Removal Procedure

Removal Procedure

1 Drain cooling water and differential oil.
2 Remove the weight, engine hood, and toe board.
3 Remove the exhaust pipe w/ muffler.
4 Remove the radiator w/ reservoir tank.
5 Remove the battery w/ bracket.
6 Remove the accelerator pedal bracket.
7 Remove the return filter.
8 Remove the oil pump.
9 Disconnect the electrical wiring, accelerator wire and fuel piping.
10 Remove the axle shaft.
11 Remove the engine w/ torque converter ASSY. [Point 1]
12 Drain torque converter oil.
13 Disconnect the torque converter ASSY.

Installation Procedure

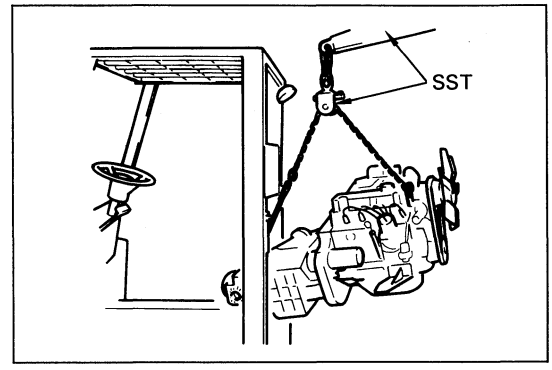
The installation procedure is the reverse of the removal procedure

Note:
(molybdenum disulfide) grease on the oil pump spline shaft.

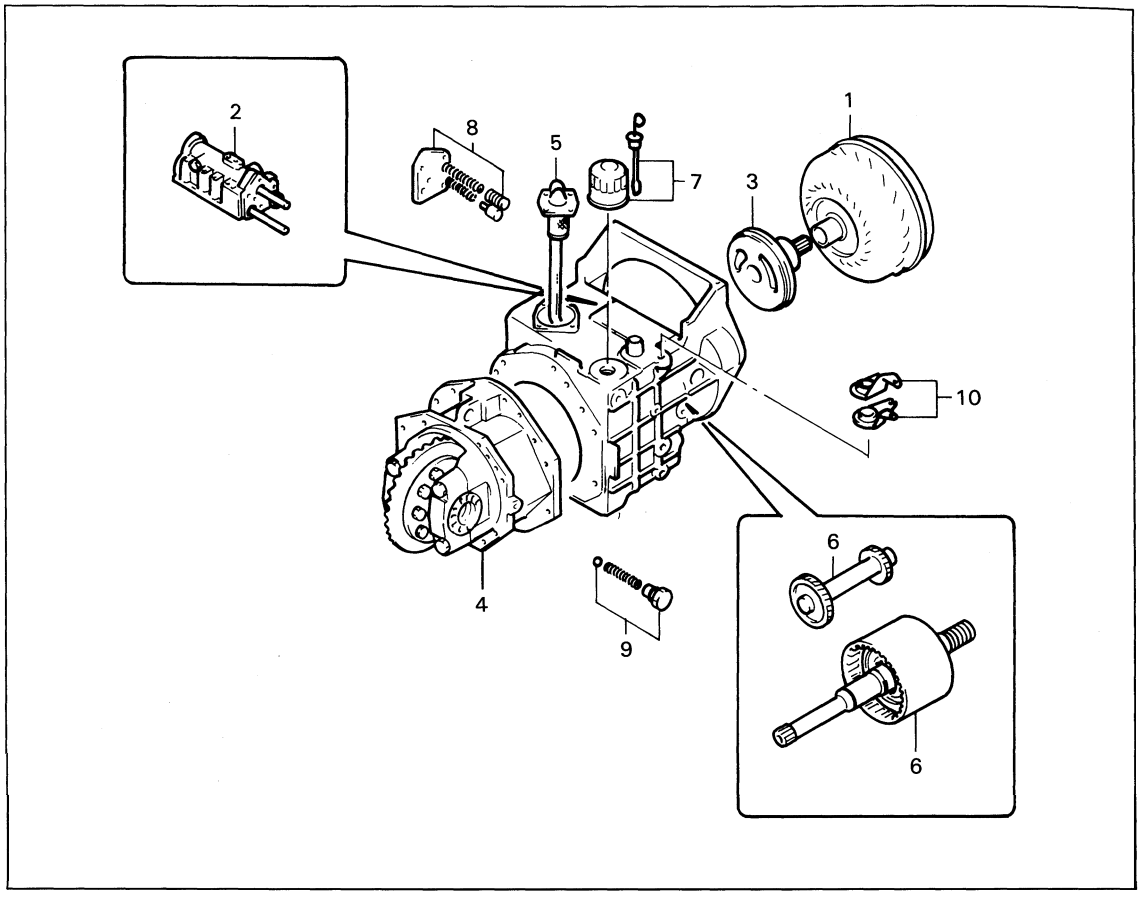
Point Operation

[Point 1]

Removal: SST 09090-04010
Removal: SST 09010-20111-71



Removing the Engine w/ Torque Converter ASSY



Torque Converter ASSY Disassembly Procedure

Disassembly Procedure

1 Remove the torque converter. [Point 1]
2 Remove the control valve.
3 Remove the oil pump.
4 Remove the differential ASSY.
5 Remove the strainer pipe.
6 Remove the clutch countergear.
7 Remove the oil filter level gage.
8 Remove the cover, regulator spring, regulator piston, torque converter inlet spring and torque converter inlet piston. [Point 2]
9 Remove the cooler relief valve. [Point 3]
10 Remove the inching lever, selector lever and pipe. [Point 4]

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure

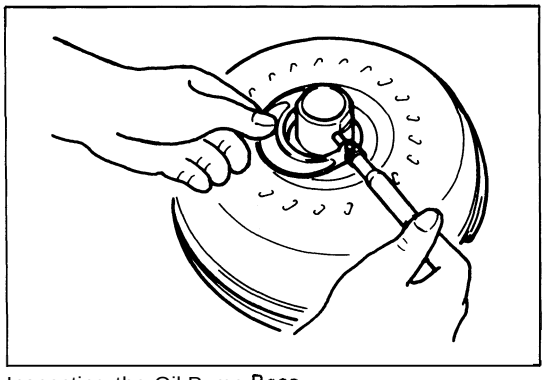
Note:

- Coat torque converter oil sufficiently on each part before assembly.
- Torque converter ASSY oil capacity: 8.4 to 9.6 liters (2.22 to 2.53 US gal). o Install each operating lever of the control valve on the link mechanism to prevent offset load application.
- When inserting the torque converter, keep the torque converter horizontally with the torque converter side of the housing facing upward. Carefully operate so as no to damage the oil bush installed on the gear pump.

Point Operation

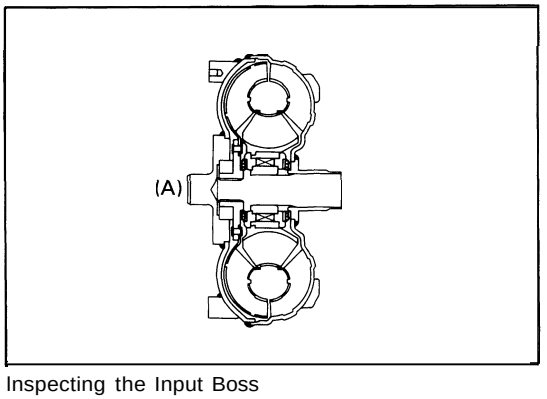
[Point 1]

Inspection: Inspect the outside diameter of the torque converter oil pump boss.
Standard:
5141.915 – 41.965 mm
(1.65020 – 1.65217 in)
Limit: 41.815 rnm (1.64626 in)



Inspecting the Oil Pump Boss

Inspection: Inspect outside diameter (A) of the torque converter input boss.
Standard: 31.936 – 31.955 mm
(1.25732 – 1.25867 in)
Limit: 31.886 mm (1.25535 in)



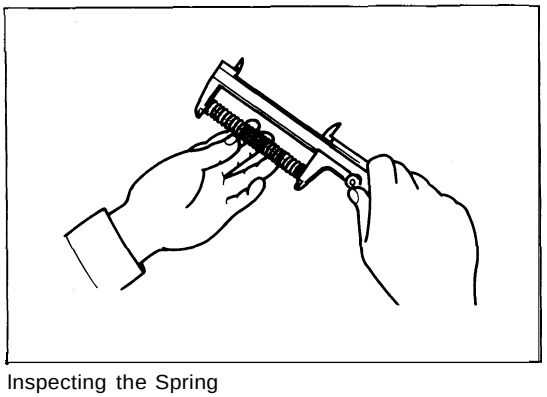
Inspecting the Input Boss

[Point 2]

Inspection: Inspect the clearance between the regulator piston/torque converter inlet piston and the housing hole.
Standard: 0.02 – 0.058 rnm
(0.0008 – 0.00228 in)
Limit: 0.10 rnrn (0.0039 in)

Inspection: Inspect the free length of the regulator valve spring.
Standard: 123.43 rnrn (4.8594 in)
Limit: 120.81 rnrn (4.7563 in)

Inspection: Inspect the free length of the torque converter inlet valve spring.
Standard: 97.8 rnm (3.850 in)
Limit: 94.12 mm (3.7055 in)

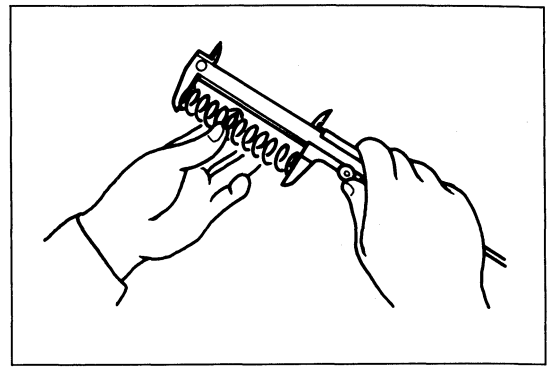


Inspecting the Spring

[Point 31

Inspection: Inspect the free length of the cooler relief valve spring

Standard: 97.01mm (3.8193in)
Limit: 93.43mm (3.6783in)

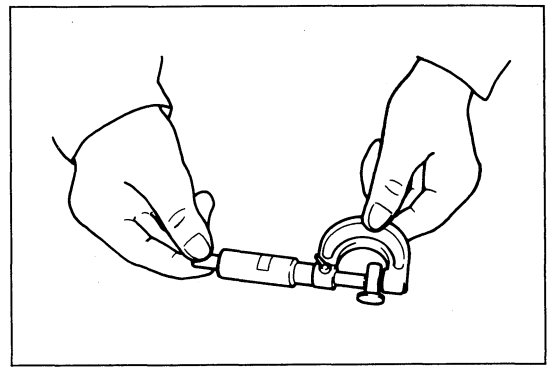


Inspecting the Relief Valve Spring

[Point 41

Inspection: Inspect the lever set pin diameter.

Standard: 5.985 – 6.00mm
(0.23563 – 0.2362in)
Limit: 5.900mm (0.23228in)



Inspecting the Lever Set Pin

Inspection: Inspect the lever bush inside diameter

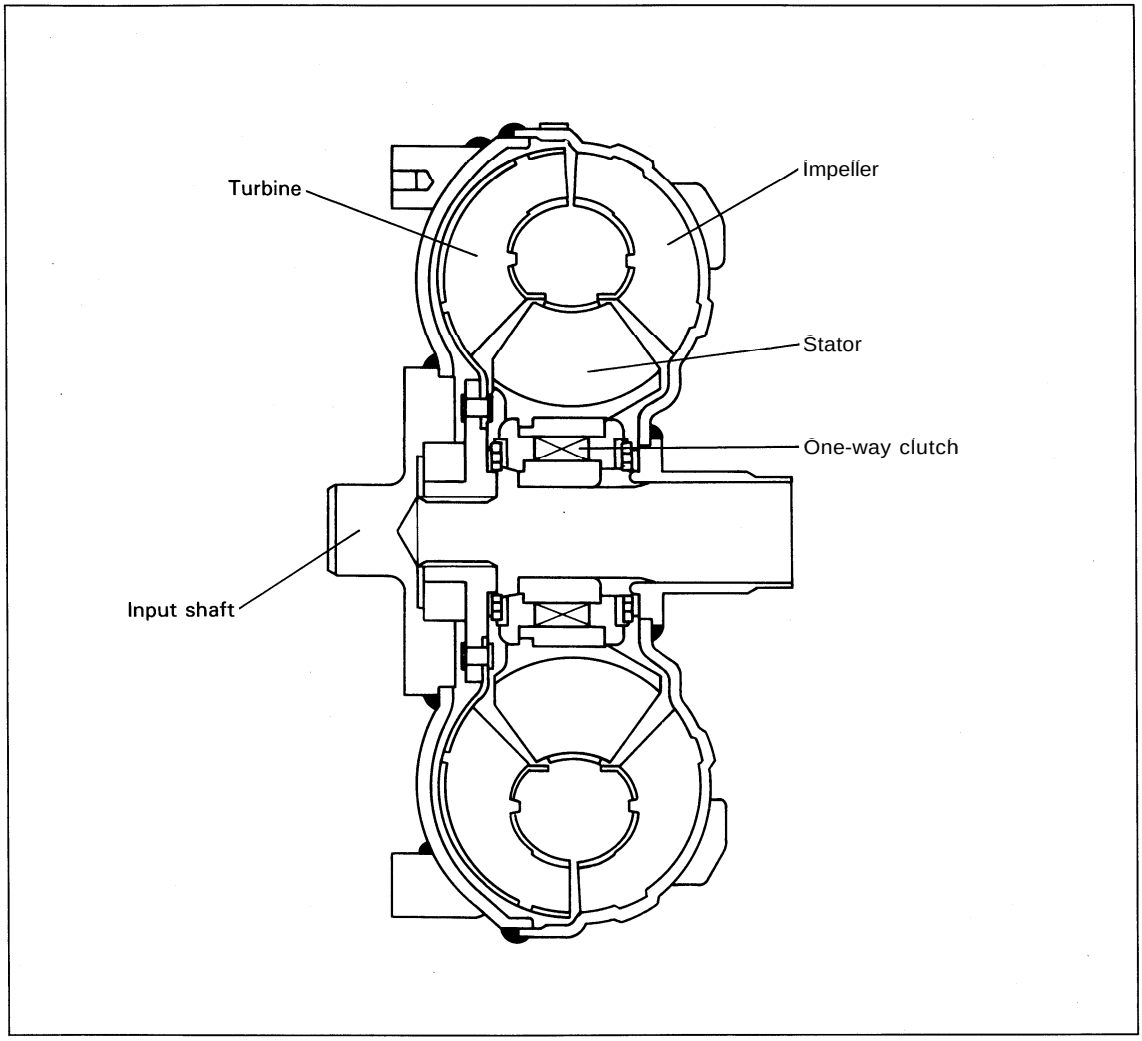
Standard: 20.0 – 20.081 mm
(0.787 – 0.79059in)
Limit: 20.28 mrn (0.7984 in)

Inspection: Inspect the pipe diameter.

Standard: 19.954 – 19.975 mm
(0.78559 – 0.78642 in)
Limit: 19.85 mm (0.7815 in)

TORQUE CONVERTER

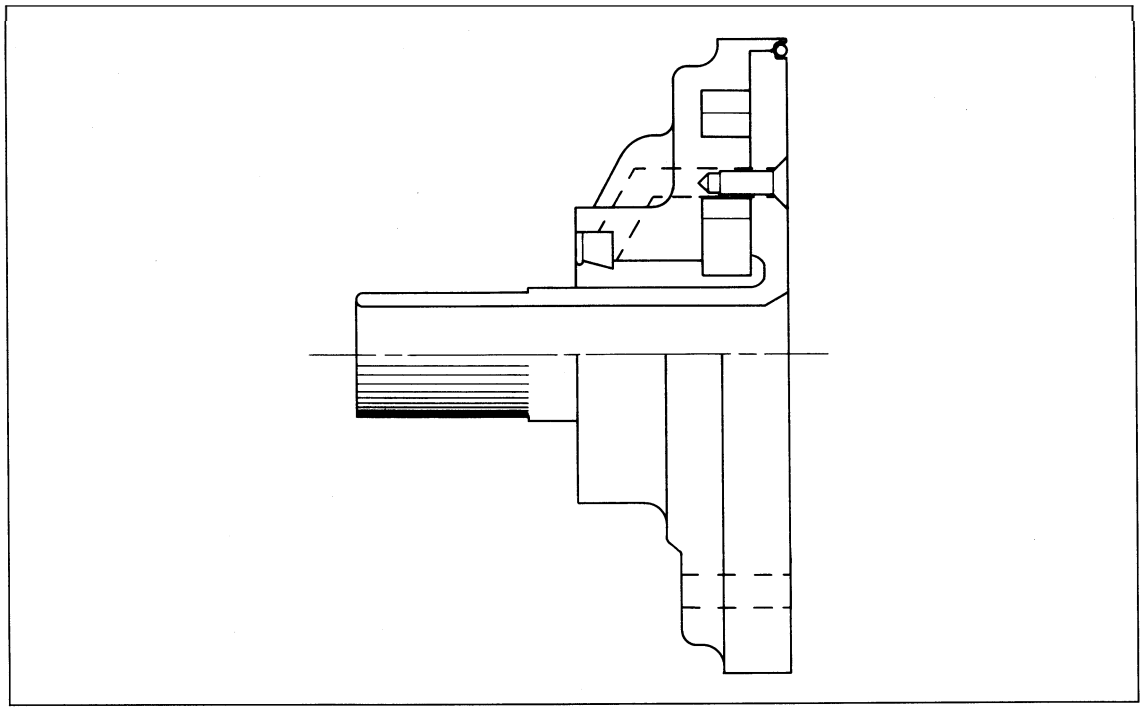
This is a 3-element, single-stage, 2-phase type torque converter consisting of the impeller coupled with the input shaft, turbine coupled with the output shaft, and the wheel starter with the built-in one-way clutch fixed to the housing. When the power from the engine is transmitted to the impeller via the input plate front cover, the hydraulic oil is pushed out along the impeller vane by the centrifugal force.
The discharged oil flows into the turbine vanes and the resultant torque is transmitted to the turbine shaft (clutch shaft) via the turbine hub.
The direction of the oil discharged from the turbine is changed by the wheel stator for reentrance into the impeller vanes at a desirable angle. The reaction torque generated then is added to the turbine torque to increase the output torque accordingly as compared with the input torque.
As a one-way clutch frees the wheel stator in the high speed ratio range then to automatically change the torque converter to a hydraulic joint, efficient operation is possible in the high speed ratio range.



Torque Converter

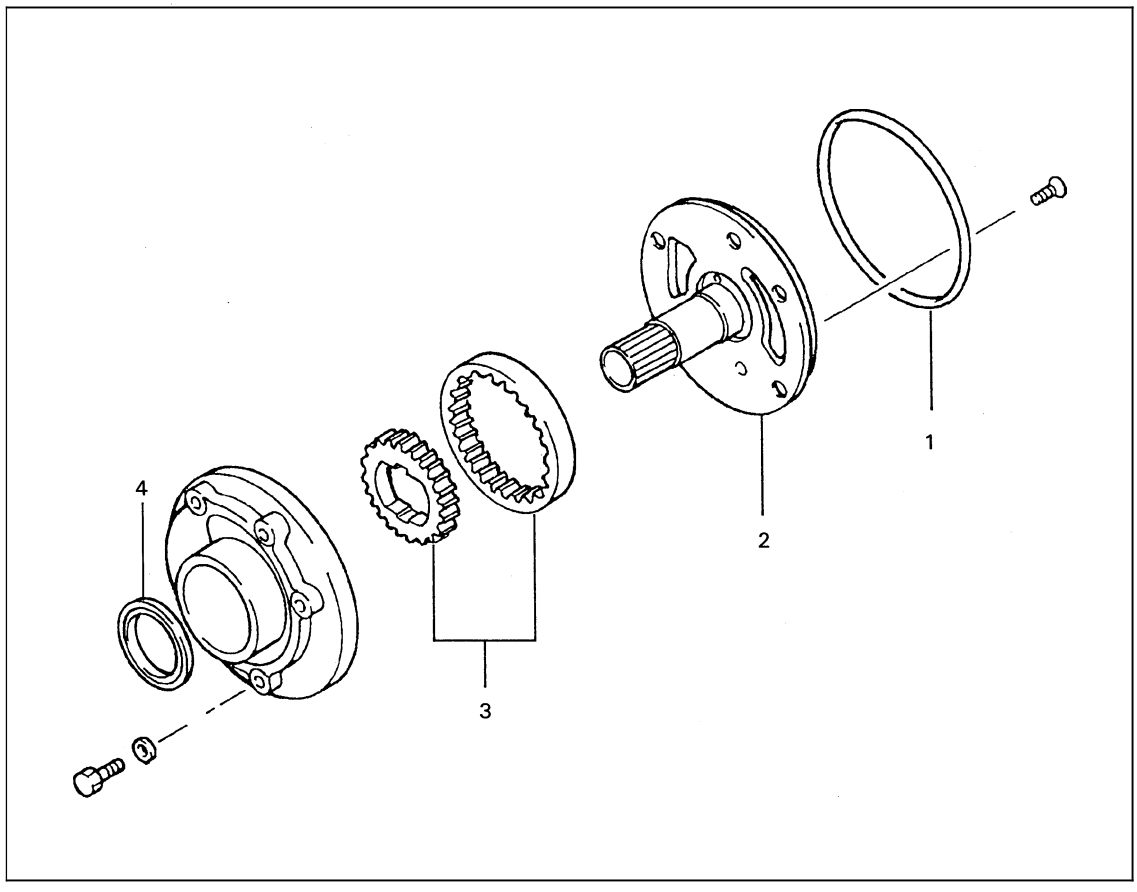
OIL PUMP

Two flat planes at the tip end of the torque converter impeller directly drive the drive gear. A compact internal gear pump with relatively low operating sound is adopted.



Oil Pump

DISASSEMBLY·INSPECTION·REASSEMBLY



Oil Pump Disassembly Procedure

Disassembly Procedure

1 Remove the O-ring.
2 Remove the stator shaft. [Point 1]
3 Remove the drive gear and driven gear. [Point 2]
4 Remove the oil seal.

Reassembly Procedure

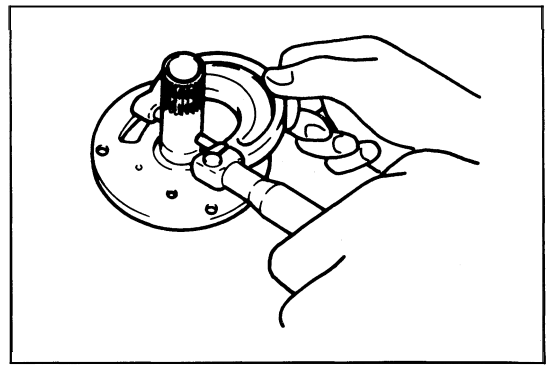
The reassembly procedure is the reverse of the disassembly procedure.

Note:
- Clean the parts other than gaskets, O-rings, and sealing parts sufficiently, and assemble them after coating torque converter oil.
- Coat grease on the O-ring and oil seal lip before assembly.
- Coat Lcoktite (#271) on the periphery of the oil seal.

Point Operation

[Point 1]

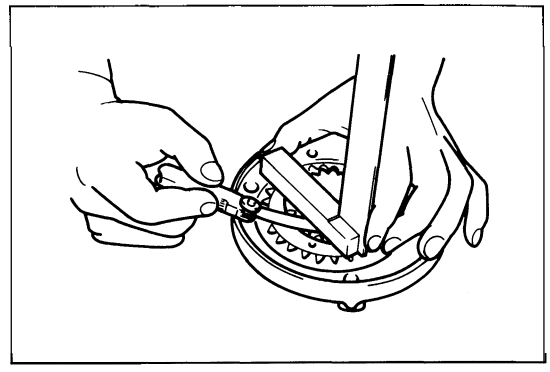
Inspection: Inspect the clearance between the stator shaft outside diameter and gear pump bush inside diameter.
Standard:
0.035 – 0.124 mm
(0.00138 – 0.00488 in)
Limit: 0.17 mm (0.0069 in)



Inspecting the Stator Shaft

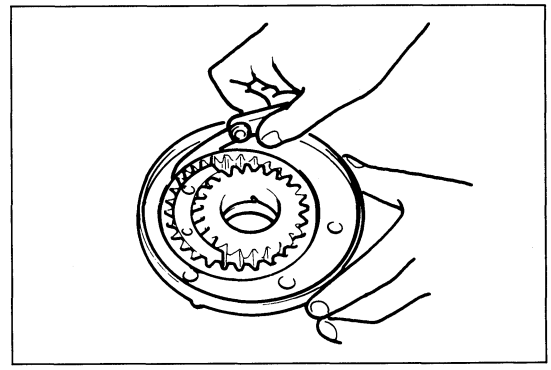
[Point 2]

Inspection: Inspect the clearance between the gear pump case and pump gear.
Standard:
0.030 – 0.065 mm
(0.00118 – 0.00256 in)
Limit: 0.1 mm (0.004 in)



Inspecting the Pump Gear

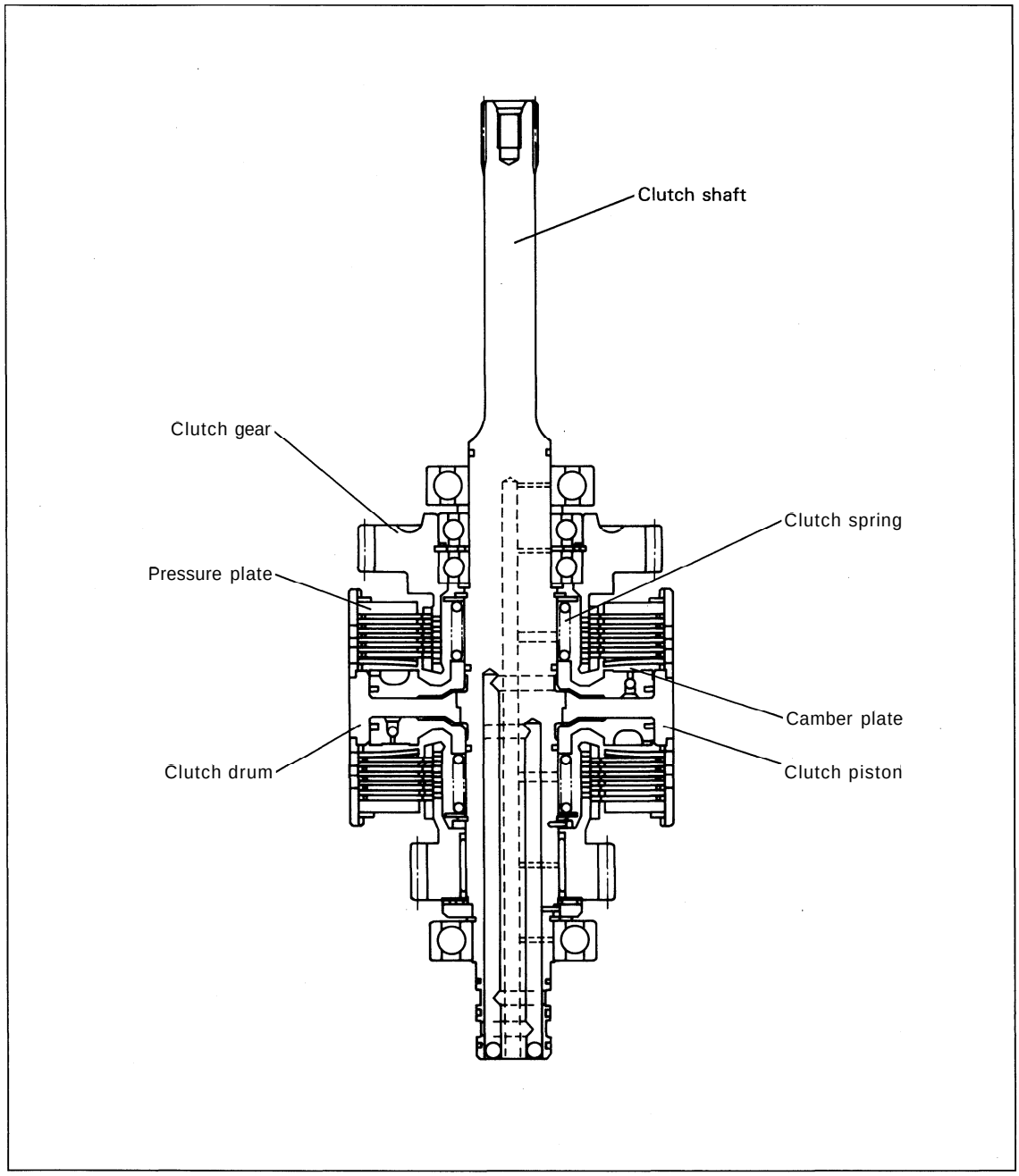
Inspection: Inspect the clearance between the driven gear and pump body.
Standard: 0.17 – 0.23 mm
(0.0067 – 0.0091 in)
Limit: 0.3 mm (0.012 in)



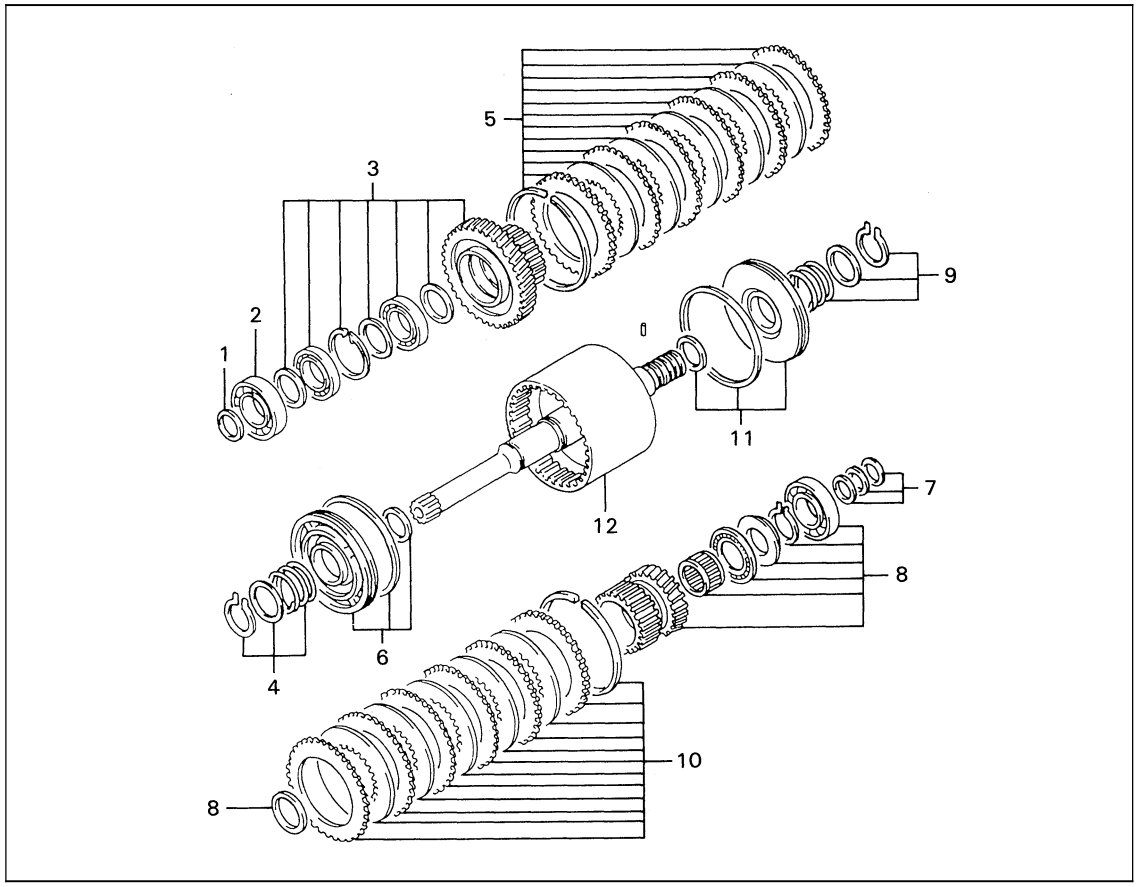
Inspecting the Pump Body

CLUTCH

Four clutch plates, five clutch discs, one camber plate, one piston and one pressure plate are housed inside of the clutch.
The camber plate, drive plates and clutch discs are compressed as the piston is operated, resulting in fewer transmission from the clutch drum integrated with the clutch shaft to the gear through the drive plates and discs.
In the neutral state, the clutch spring operates the clutch piston in the reverse direction to release the clutch.



Clutch



Clutch Disassembly Procedure

Disassembly Procedure

1 Remove the seal bearing. [Point 11
2 Remove the bearing. [Point 2]
3 Remove the forward gear. [Point 31
4 Remove the clutch spring. [Point 41
5 Remove the clutch plates, clutch discs, clutch pressure plate and camber plate. [Point 51
6 Remove the piston and seal ring. [Point 6]
7 Remove the seal rings. [Point 71
8 Remove the reverse gear. [Point 81
9 Remove the clutch spring. [Point 91
10 Remove the clutch plates, clutch discs, clutch pressure plate and camber plate. [Point 101
11 Remove the piston and seal ring. [Point 11]
12 Remove the clutch drum. [Point 121

Reassembly Procedure

The reassembly procedure is the reverse of the disassembly procedure.

Note:
- Coat torque converter oil sufficiently on each part before assembly.
- When installing the seal ring, carefully operate so as no to let its joint open.
- Install the camber plate, clutch discs and back plate in the correct direction.

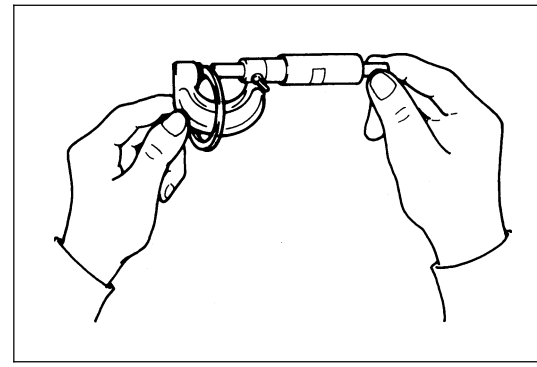
Point Operation

[Point 1]

Inspection: Inspect the seal ring.

Seal ring width
Standard: 2.28 – 2.33 rnrn
(0.0898 – 0.0917 in)
Limit: 2.08 mrn (0.0819 in)

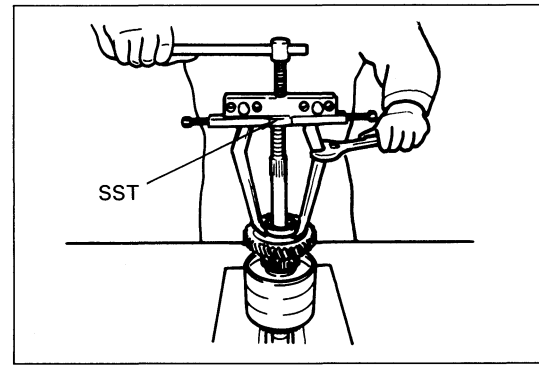
Seal ring joint clearance
Standard: 0.05 – 0.30 rnm
(0.0020 – 0.0118 in)
Limit: 1.0 rnrn (0.039 in)



Inspecting the Seal Ring

[Point 21

Disassembly: SST 09950-20017

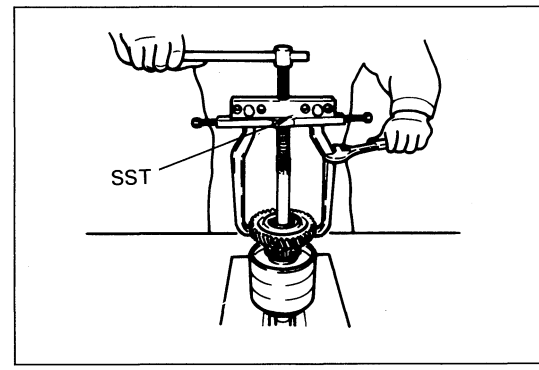


Removing the Bearing

[Point 31

Disassemblv: SST 09950-20017

Disassembly: Extract the forward gear upward after setting the clutch drum vertically as shown at left. If placed horizontally, the spacer between two bearings will fit into the shaft seal ring groove to obstruct extraction.

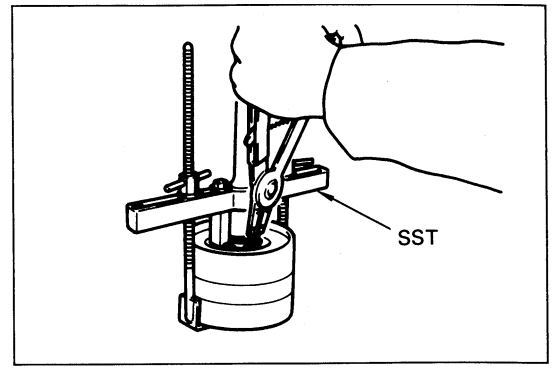


Removing the Forward Gear

[Point 4]

Disassembly: SST 09220-22000-71

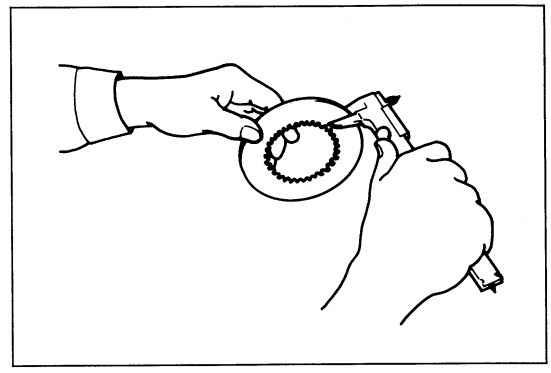
Inspection: Inspect the free length of the clutch spring.
Standard: 38.83 mm (1.5287 in)
Limit: 35.75 mm (1.4075 in)



Removing the Clutch Spring

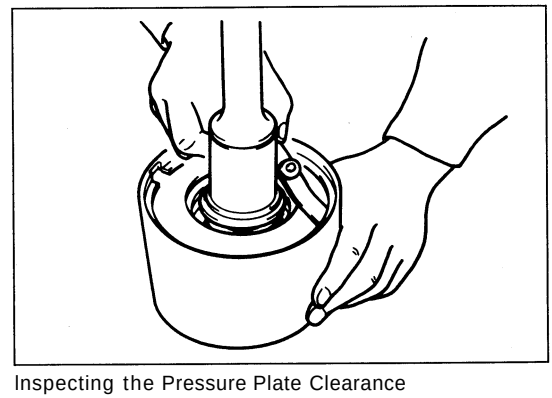
[Point 5]

Inspection: Inspect the clutch discs.
Standard thickness:
2.50 – 2.65 mm
(0.0984 – 0.1043 in)
Wear limit: 2.3 mm (0.091 in)
Replace all clutch discs if any disc is worn beyond the limit.


Inspecting the Clutch Discs

Inspection: Inspect the clutch plates.
Standard thickness:
1.53 – 1.67 mm
(0.0602 – 0.0657 in)
Wear limit:
1.40 mm (0.0551 in)
Replace all plates if any plate is worn beyond the limit.

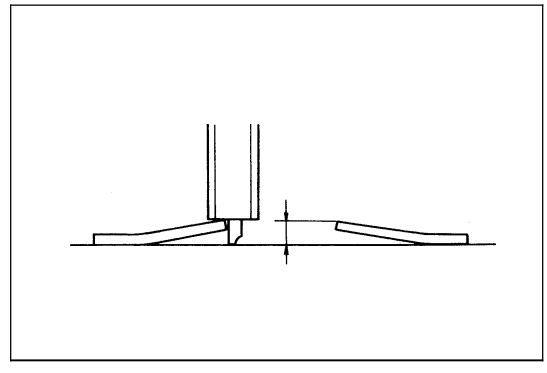
Inspection: Inspect the clearance between the pressure plate and snap ring.
Standard: 1.6 – 1.8 mm
(0.063 – 0.071 in)
Limit: 4.2 mm (0.165 in)
If the limit is exceeded, select and use an appropriate pressure plate.


Inspecting the Pressure Plate Clearance

unit: mm (in)

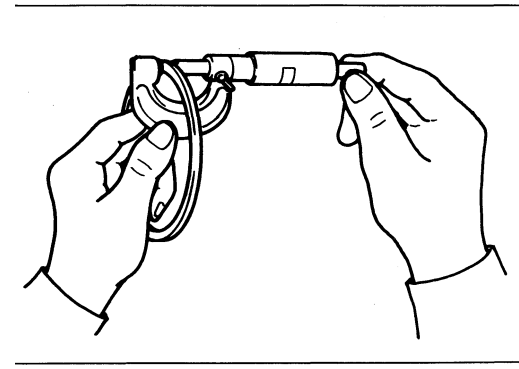
Punched mark	A	B	C	D	E
Thickness	3.9 (0.154)	4.1 (0.161)	4.3 (0.169)	4.5 (0.177)	4.7 (0.185)

Inspection: Inspect the camber plate.
Standard height:
2.85 – 3.15 mm
(0.1122 – 0.1240 in)
Limit: 2.5 mm (0.098 in)


INspecting the Camber Plate

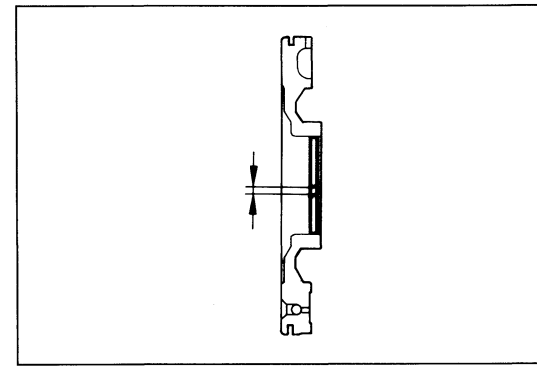
[Point 61

Inspection: Inspect the seal ring width.
Piston outer seal ring width
Standard: 2.40 – 2.45 mm
(0.0945 – 0.0965 in)
Limit: 2.20 mm (0.0866 in)
Piston inner seal ring width
Standard: 2.30 – 2.35 mm
(0.0906 – 0.0925 in)
Limit: 2.10 mm (0.0827 in)



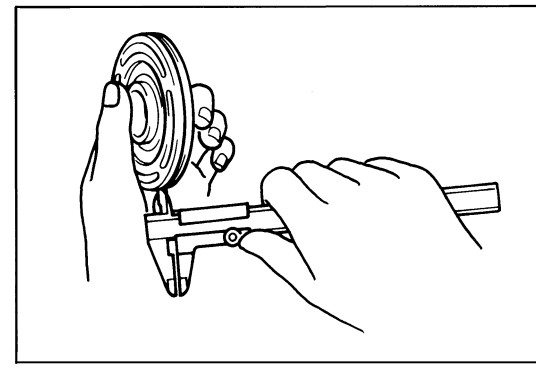
Inspecting the Seal Ring Width

Inspection: Inspect the seal ring joint width.
Piston outer seal ring
Standard: 0.05 – 0.35 mm
(0.0020 – 0.0138 in)
Limit: 1.0 mm (0.039 in)
Piston inner seal ring
Standard: 0.5 – 0.30 mm
(0.0020 – 0.0118 in)
Limit: 1.0 mm (0.039 in)



Inspecting the Seal Ring Joint Clearance

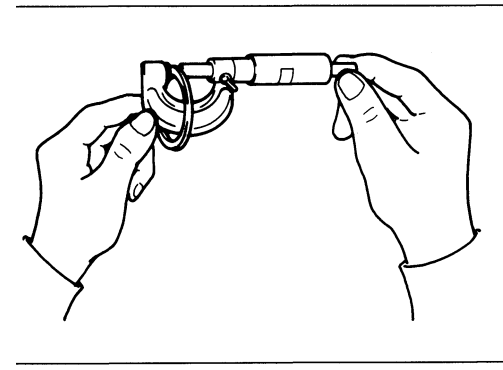
Inspection: Inspect the piston outer seal ring groove width.
Standard: 2.51 – 2.58 mm
(0.0988 – 0.1016 in)
Limit: 2.7 mm (0.106 in)



Inspecting the Seal Ring Groove Width

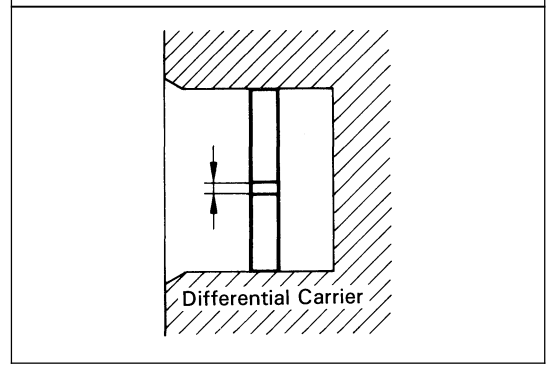
[Point 71

Inspection: Inspect the seal ring width.
Standard: 2.28 – 2.33 mm
(0.0898 – 0.0917 in)
Limit: 2.08 mm (0.0819 in)



Inspecting the Seal Ring Width

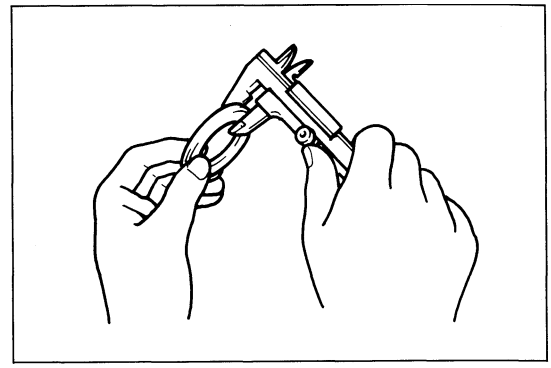
Inspection: Inspect the seal ring joint clearance.
Standard: 0.05 – 0.30 mm
(0.0020 – 0.0118 in)
Limit: 1.0 mm (0.039 in)



Inspecting the Seal Ring Joint Clearance

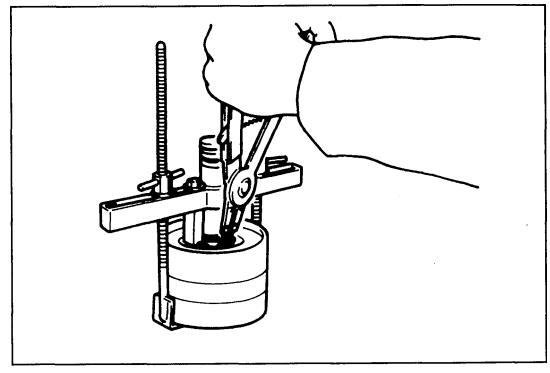
[Point 8]

Inspection: Inspect the thrust washer width.
Thrust washer, large
Standard: 5.4 – 5.5 mm
(0.213 – 0.217 in)
Limit: 5.3 mm (0.209 in)
Thrust washer, small
Standard: 3.5 – 3.6 mm
(0.133 – 0.142 in)
Limit: 3.4 mm (0.134 in)


Inspecting the Thrust Washer

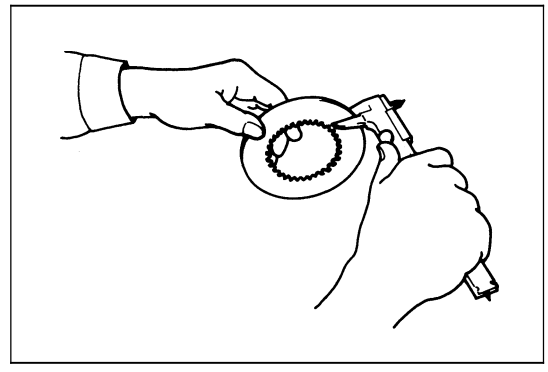
[Point 9]

Disassembly: SST 09220-22000-71
Inspection: Inspect the free length of the clutch spring.
Standard: 38.83 mm (1.5287 in)
Limit: 35.75 mm (1.4075 in)

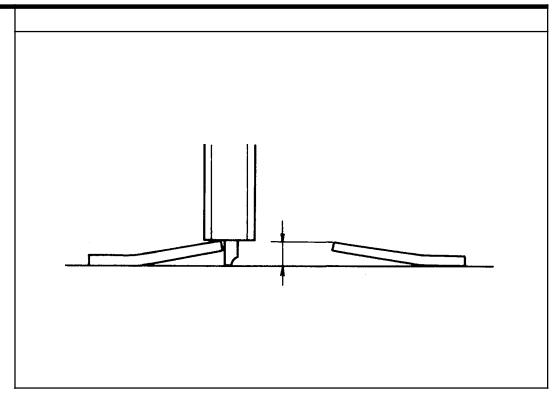

Removing the Clutch Spring

[Point 10]

Inspection: Inspect the clutch discs.
Standard thickness:
2.50 – 2.65 mm
(0.0984 – 0.1043 in)
Wear limit: 2.3 mm (0.091 in)
If any disc is worn beyond the limit, replace all clutch discs.
Inspection: Inspect the drive plates.
Standard thickness:
1.53 – 1.67 mm
(0.0602 – 0.0657 in)
Wear limit: 1.40 mm (0.0551 in)
If any plate is worn beyond the limit, replace all drive plates.


Inspecting the Clutch Discs

Inspection: Inspect the camber plate.
Standard height:
2.85 – 3.15 mm
(0.1122 – 0.1240 in)
Limit: 2.5 mm (0.098 in)

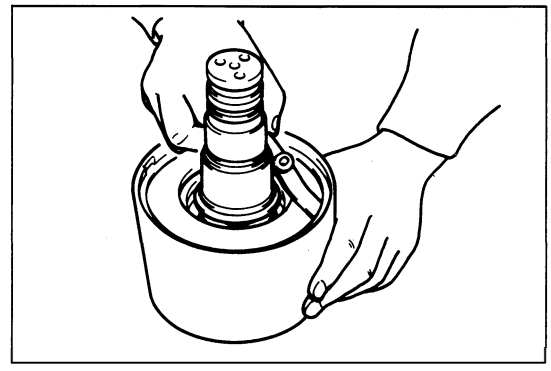


Inspecting the Camber Plate

Inspection: Inspect the clearance between the pressure plate and snap ring.
Standard: 1.6 – 1.8 mm
(0.063 – 0.091 in)
Limit: 4.2 mm (0.165 in)
When the limit is exceeded, select and use an appropriate pressure plate.

unit: mm (in)

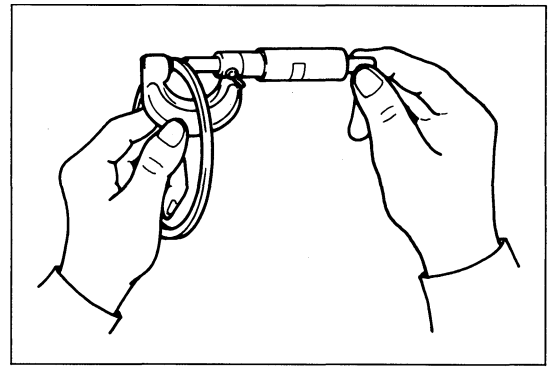
Punched mark	A	B	C	D	E
Thickness	3.9 (0.1541)	4.1 (0.161)	4.3 (0.169)	4.5 (0.177)	4.7 (0.185)



Inspecting the Pressure Plate Clearance

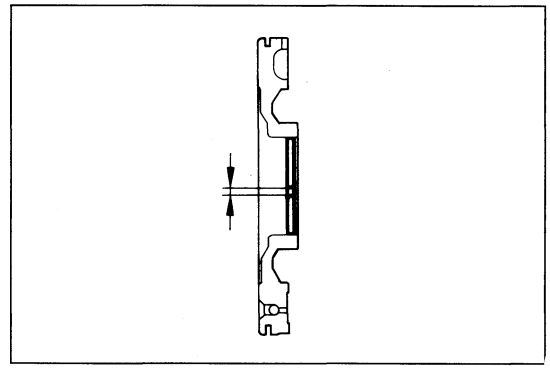
[Point 11]

Inspection: Inspect the seal ring width.
Piston outer seal ring width
Standard: 2.40 – 2.45 mm
(0.0945 – 0.0965 in)
Limit: 2.2 mm (0.089 in)
Piston inner seal ring width
Standard: 2.30 – 2.35 mm
(0.0906 – 0.0925 in)
Limit: 2.1 mm (0.083 in)



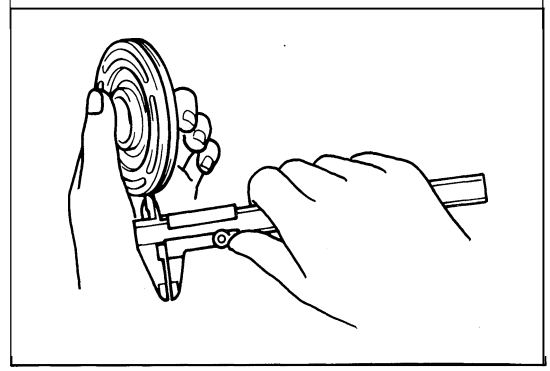
Inspecting the Seal Ring

Inspection: Inspect the seal ring joint clearance.
Piston outer seal ring
Standard: 0.05 – 0.35 mm
(0.0020 – 0.0138 in)
Limit: 1.0 mm (0.039 in)
Piston inner seal ring
Standard: 0.05 – 0.30 mm
(0.0020 – 0.0118 in)
Limit: 1.0 mm (0.039 in)



Inspecting the Joint Clearance

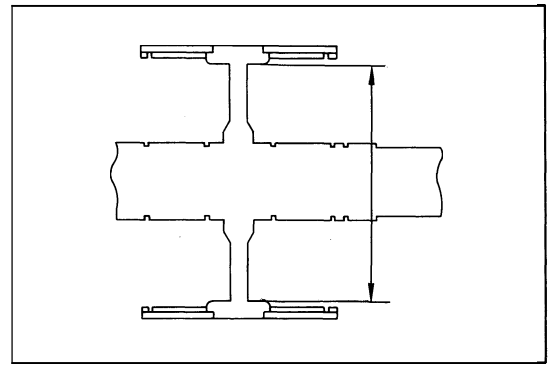
Inspection: Inspect the piston outer seal ring groove width.
Standard: 2.51 – 2.58 mm
(0.0988 – 0.196 in)
Limit: 2.7 mm (0.106 in)



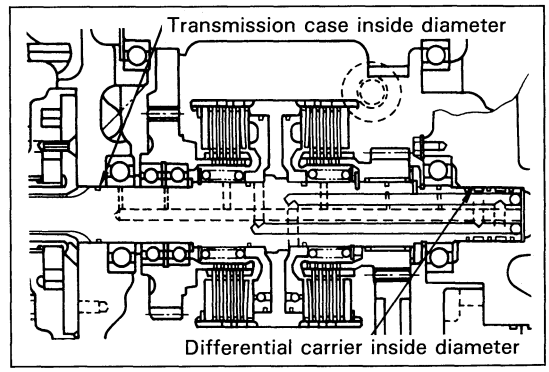
Inspecting the Seal Ring Groove Width

[Point 12]

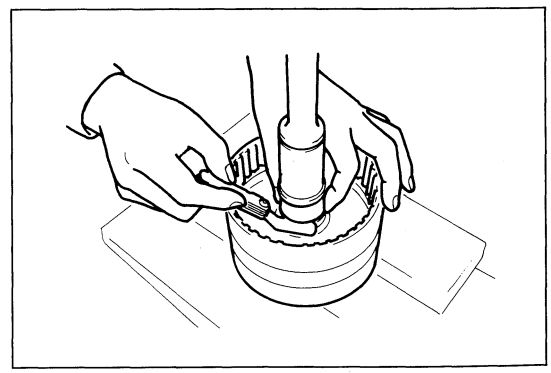
Inspection: Inspect the diameter of the seal ring sliding piston.
Piston inside diameter
Standard: 40.20 – 40.25 mm
(1.5827 – 1.5846 in)
Limit: 40.35 mm (1.5886 in)
Differential carrier inside diameter (shaft tip end side)
Standard: 32.20 ~ 32.25 mm
(1.2670 – 1.2699 in)
Limit: 32.35 mm (1.2936 in)
Transmission case inside diameter
Standard: 35.20 – 32.25 mm
(1.3859 – 1.3878 in)
Limit: 35.35 mm (1.3917 in)
Clutch drum inside diameter
Standard: 122.0 – 122.05 mm
(4.803 – 4.8051 in)
Limit: 122.15 mm
(4.8091 in)



Inspecting the Clutch Drum Inside Diameter



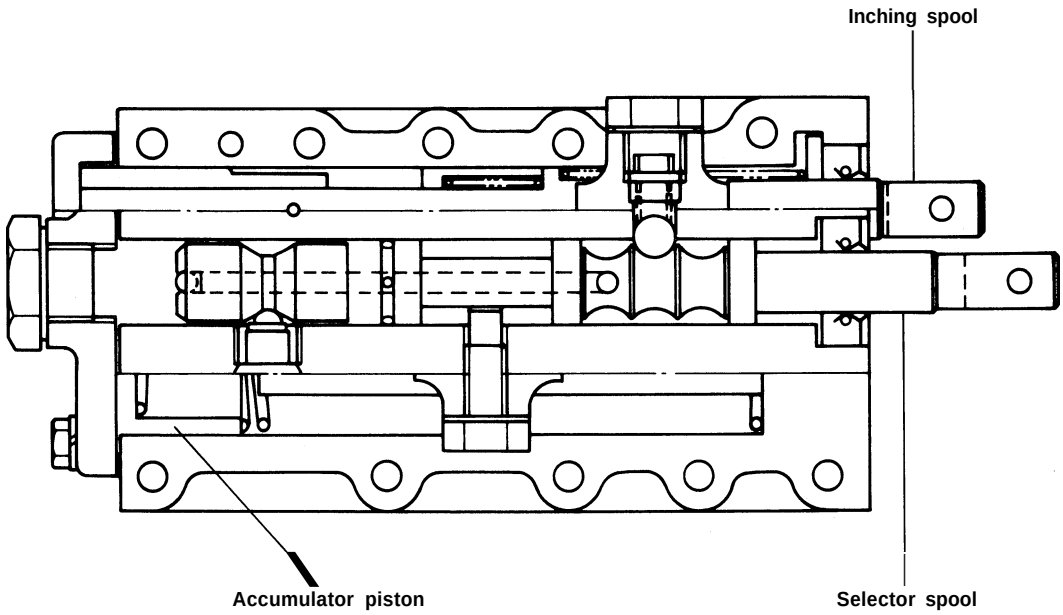
Inspection: Inspect the shaft seal ring groove width
Piston inside diameter side
Standard: 2.4 – 2.6 mm
(0.094 – 0.102 in)
Limit: 2.7 mm (0.106 in)
Shaft tip end side (3 places)
Standard: 2.4 – 2.6 mm
(0.094 – 0.102 in)
Limit: 2.7 mm (0.106 in)
Torque converter side
Standard: 2.4 – 2.6 mm
(0.094 – 0.102 in)
Limit: 2.7 mm (0.106 in)



Inspecting the Seal Ring Groove Width

CONTROL VALVE

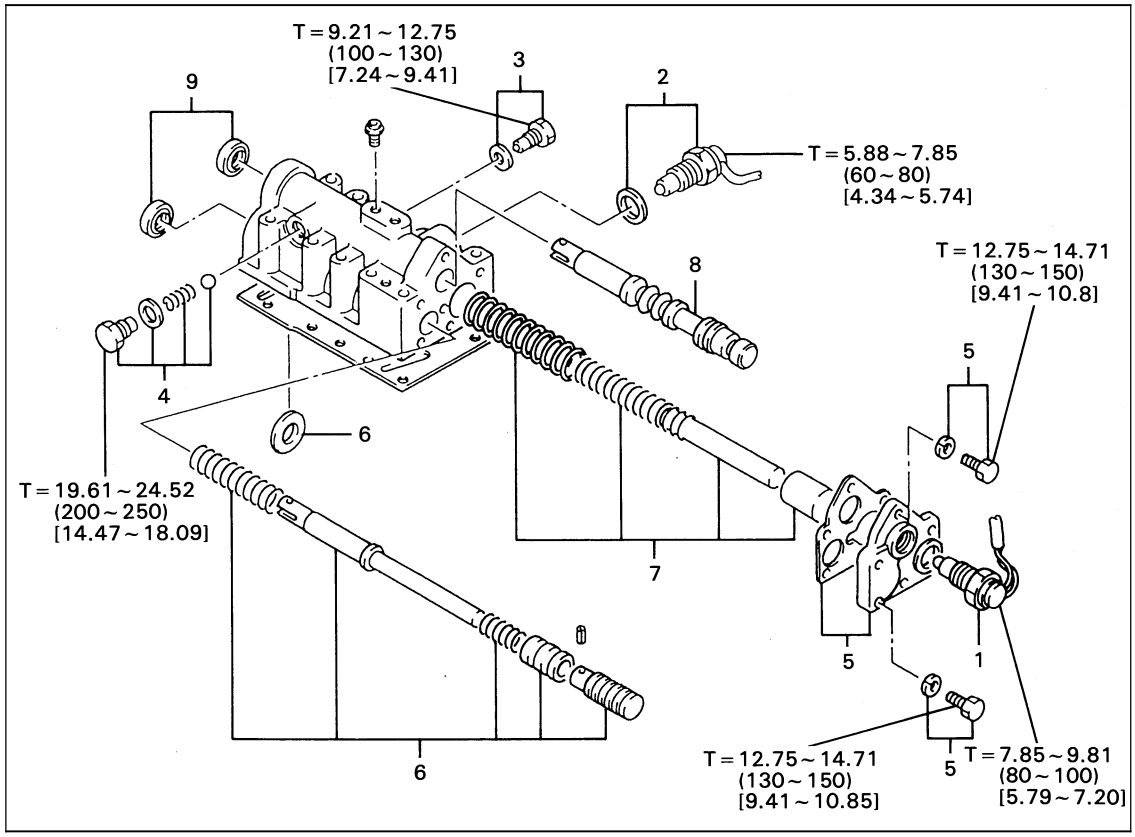
A spool type valve is used for shifting between forword, neutral and revesse.
The valve has an inching mechanism for releasing the hydraulic clutch when the vehicle is stopped and a modulation mechanism for relaxing the starting and shifting shocles.



Control Valve

DISASSEMBLY·INSPECTION·REASSEMBLY

T = N.m (kg-cm) [ft-lb]



Control Valve Disassembly Procedure

Disassembly Procedure

1 Remove the back switch (OPT). [Point 1]
2 Remove the neutral switch. [Point 2]
3 Remove the plug.
4 Remove the plug, detent spring and ball. [Point 3]
5 Remove the cover.
6 Remove the inching spool, inching spring, return spring and plate. [Point 4]
7 Remove the piston, stopper, and a accumulator spring. [Point 5]
8 Remove the selector spool. [Point 6]
9 Remove the oil seals.

Reassembly Procedure

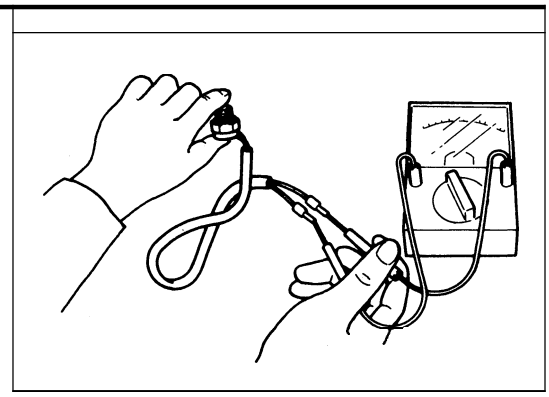
The reassembly procedure is the reverse of the disassembly procedure

Note:
- Coat grease on the oil seal lips.
- Coat Locktite (#271) when installing the oil seals.
- Wash the piston and spool fully and coat torque converter oil before assembly.

Point Operation

[Point 1]

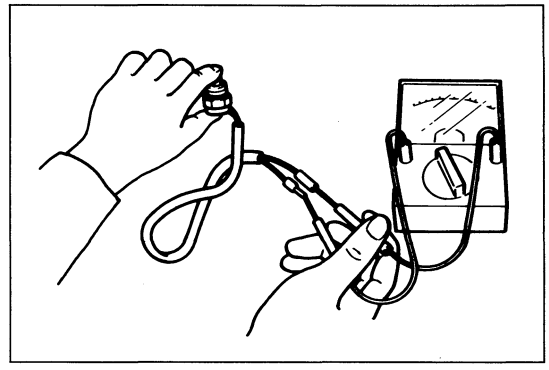
Inspection: Inspect the back switch operation.
When the shaft is depressed:
closed
When the shaft is extended:
open



Inspecting the Back Switch

[Point 2]

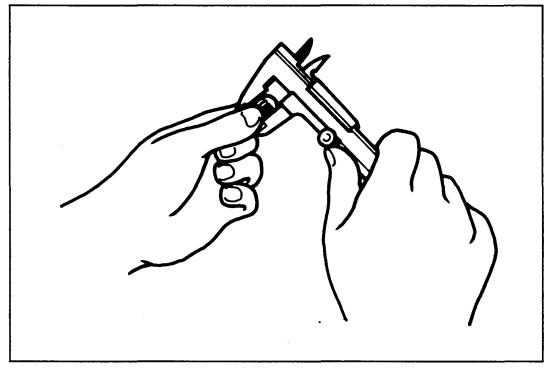
Inspection: Inspect the neutral switch operation.
When the shaft is depressed:
open
When the shaft is extended:
closed



Inspecting the Neutral Switch

[Point 3]

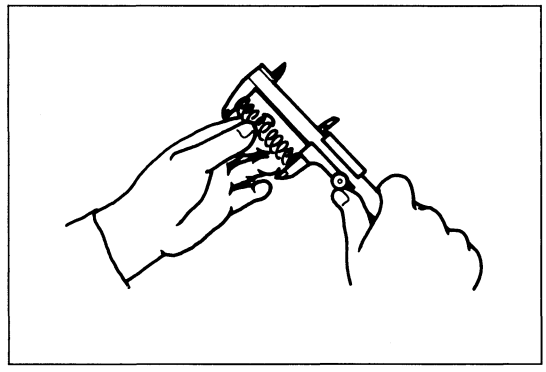
Inspection: Inspect the free length of the spring
Standard: 17.96 mm (0.7071 in)
Limit: 17.70 mm (0.6969 in)



Inspecting the Detent Spring

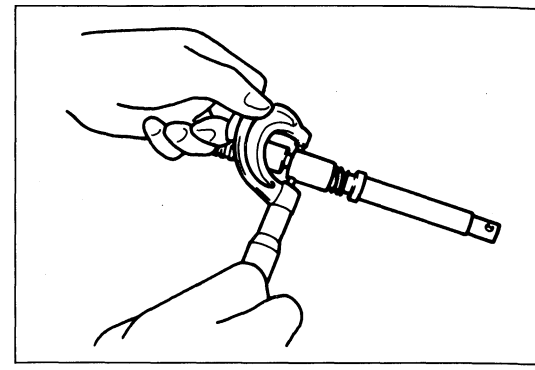
[Point 4]

Inspection: Inspect the free length of each spring.
Inching spring
Standard: 30.79 mm (1.2122 in)
Limit: 29.93 mm (1.1783 in)
Return spring
Standard: 77.0 mm (3.031 in)
Limit: 75.16 mm (2.9591 in)



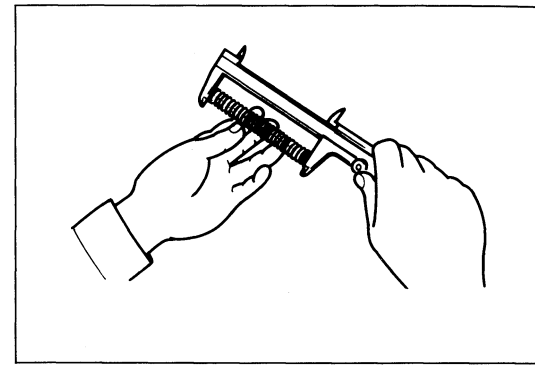
Inspecting the Spring

Inspection: Inspect the inching spool.
Outside diameter
Standard:
13.973 – 14.00 mm
(0.55012 – 0.55118 in)
Limit: 13.873 mm (0.54618 in)
Clearance between inching spool and body
Standard:
0.02 – 0.062 mm
(0.0008 – 0.00244 in)
Limit: 0.10 mm (0.0039 in)


Inspecting the Inching Spool

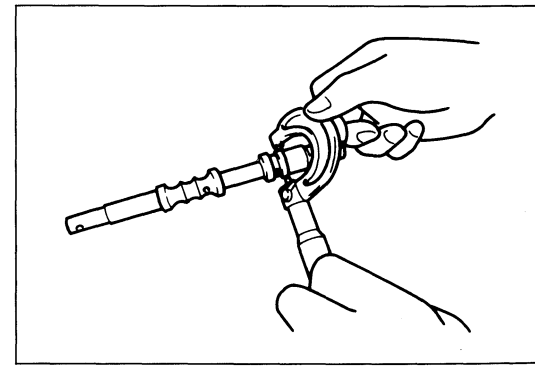
[Point 5]

Inspection: Inspect the free length of the spring.
Accumulator spring (large diameter side)
Standard:
128.44 mm (5.0569 in)
Limit: 127.31 mm (5.0122 in)
Accumulator spring (small diameter side)
154.06 mm (6.0654 in)
Limit: 152.85 mm (6.0177 in)
Clearance between accumulator piston and body
Standard:
0.02 – 0.062 mm
(0.0008 – 0.00244 in)
Limit: 0.10 mm (0.0039 in)


Inspecting the Spring

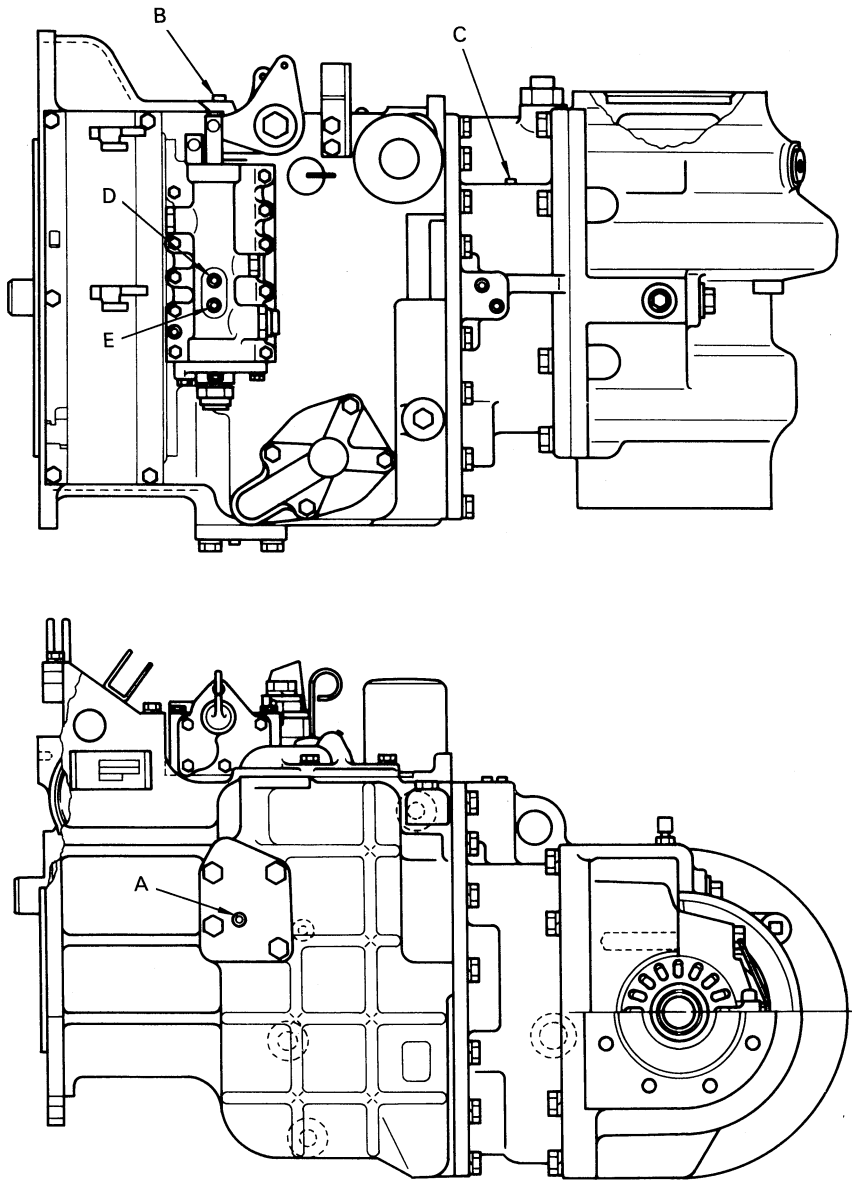
[Point 6]

Inspection: Inspect the selector spool.
Outside diameter
Standard:
13.973 – 14.00 mm
(0.55012 – 0.5512 in)
Limit: 13.873 mm (0.54618 in)
Clearance between selector spool and body
Standard:
0.02 – 0.061 mm
(0.0008 – 0.00240 in)
Limit: 0.10 mm (0.0039 in)


Inspecting the Selector Spool

OIL PRESSURE MEASUREMENT

1. Run the engine at the idling speed, and check the oil level with the level gage.
2. Set a pressure gage, with the front tires floating above the ground.
3. Check the oil pressure when the engine speed is 700 rpm and 2000 rpm.
4. Start the engine, set the shift lever in the neutral position, and measure the inlet pressure (A) and outlet pressure (B). 5. Start the engine, set the shift lever in the neutral position and measure the lubrication pressure (C).
   Start the engine, set the shift lever in the forward (D) or reverse (E) position, and measure the clutch pressure.



* See the specifications (on page 0-5) for each operating pressure.

Oil Pressure Measurement

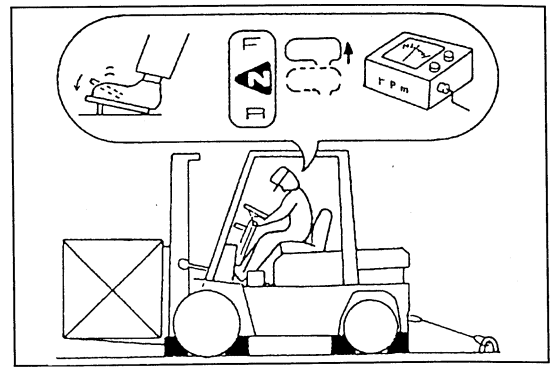
STALL TEST

1. Check the front and rear wheels, place the maximum load on the fork, apply the parking brake and tie the drawbar with a wire rope to make the vehicle immovable.

2. Measure the relief rpm.
   The relief rpm shall be approximately 150 to 300 rprn less than the maximum no-load rpm. In the LPG vehicle, the rpm reduction is slightly greater than the value above.

3. Accelerate the engine fully until the rprn is stabilized, and check the value (stall rpm) when the shift lever is shifted to the D position.

Engine	Stall rpm
4Y	1800 – 2050 rprn
4P	2050 – 2300 rprn



Measuring the Stall Rpm

APPENDIX

	Page
TABLE OF SERVICE STANDARD	1-2
SST LIST	1-6

TABLE OF SERVICE STANDARDS

TORQUE CONVERTER

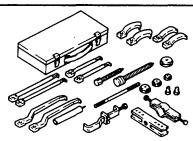
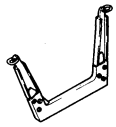
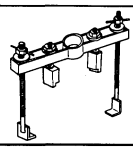
Item			Service standard
Torque converter			
Stall rpm	rpm	4Y	1800 – 2050
		4P	2050 – 2350
Torque converter oil pump boss outside diameter	mm (in)	Standard	41.915 – 41.965 (1.65020 – 1.65217)
		Limit	41.815 (1.64626)
Clearance between regulator piston/torque converter inlet piston and housing hole diameter	mm (in)	Standard	0.02 – 0.058 (0.0008 – 0.00228)
		Limit	0.10 (0.0039)
Regulator valve spring free length	mm (in)	Standard	123.43 (4.2594)
		Limit	120.81 (4.7563)
Torque converter inlet valve spring free length	mm (in)	Standard	97.8 (3.850)
		Limit	94.12 (3.7055)
Torque converter input boss outside diameter	mm (in)	Standard	31.936 ~ 31.955 (1.25732 – 1.25807)
		Limit	31.886 (1.25535)
Cooler relief valve spring free length	mm (in)	Standard	97.01 (3.8193)
		Limit	93.43 (3.6783)
Lever set pin outside diameter	mm (in)	Standard	5.985 – 6.00 (0.23563 – 0.2362)
		Limit	5.900 (0.23228)
Lever bush inside diameter	mm (in)	Standard	20.0 – 20.081 (0.789 ~ 0.79059)
		Limit	20.28 (0.7984)
Pipe outside diameter	mm (in)	Standard	19.954 – 19.975 (0.78559 – 0.78642)
		Limit	19.85 (0.7815)
Oil pump			
Clearance between stator shaft outside diameter and gear pump shoe inside diameter	mm (in)	Standard	0.035 ~ 0.124 (0.00138 ~ 0.00488)
		Limit	0.17 (0.0067)
Clearance between driven gear and pump body	mm (in)	Standard	0.17 – 0.23 (0.0067 ~ 0.0091)
		Limit	0.3 (0.012)
Clearance between gear pump case and pump gear	rnm (in)	Standard	0.030 – 0.065 (0.00118 – 0.00256)
		Limit	0.1 (0.004)
Clutch			
Torque converter side seal ring width	mm (in)	Standard	2.28 ~ 2.33 (0.0898 – 0.0917)
		Limit	2.08 (0.0819)
Torque converter side seal ring joint clearance	mm (in)	Standard	0.05 – 0.30 (0.0020 – 0.0118)
		Limit	1.0 (0.039)
Clutch spring free length	mm (in)	Standard	38.83 (1.5287)
		Limit	35.75 (1.4075)

Item			Service standard
Clutch			
Clutch disc thickness	mm (in)	Standard	2.50 – 2.65 (0.0984 – 0.1043)
		Limit	2.3 (0.091)
Drive plate thickness	mm (in)	Standard	1.53 – 1.67 (0.0602 – 0.0857)
		Limit	1.40 (0.0551)
Clearance between pressure plate and snap ring	mm (in)	Standard	1.6 – 1.8 (0.063 – 0.071)
		Limit	4.2 (0.165)
Camber plate height	mm (in)	Standard	2.85 – 3.15 (0.1122 – 0.1240)
		Limit	2.5 (0.098)
Piston outer seal ring width	mm (in)	Standard	2.40 – 2.45 (0.0945 – 0.0905)
		Limit	2.20 (0.0866)
Piston inner seal ring width	mm (in)	Standard	2.30 – 2.35 (0.0906 – 0.0925)
		Limit	2.10 (0.0829)
Piston outer seal ring joint clearance	mm (in)	Standard	0.05 – 0.35 (0.0020 ~ 0.0138)
		Limit	1.0 (0.039)
Piston inner seal ring joint clearance	mm (in)	Standard	0.05 – 0.30 (0.0020 ~ 0.0118)
		Limit	1.0 (0.039)
Piston outer seal ring groove width	mm (in)	Standard	2.51 – 2.58 (0.0988 ~ 0.1016)
		Limit	2.7 (0.106)
Seal ring width (3 places on shaft tip end side)	mm (in)	Standard	2.28 – 2.33 (0.0898 – 0.0917)
		Limit	2.08 (0.0819)
Piston seal ring joint clearance (3 places on shaft tip end side)	mm (in)	Standard	0.05 – 0.30 (0.0020 ~ 0.0118)
		Limit	1.0 (0.039)
Thrust washer (large) width	mm (in)	Standard	5.4 – 5.5 (0.213 – 0.217)
		Limit	5.3 (0.209)
Thrust washer (small) width	mm (in)	Standard	3.5 – 3.6 (0.318 – 0.142)
		Limit	3.4 (0.134)
Clutch spring free length	mm (in)	Standard	38.83 (1.5287)
		Limit	35.75 (1.4075)
Clearance between pressure plate and snap ring	mm (in)	Standard	1.6 – 1.8 (0.063 – 0.071)
		Limit	4.2 (0.165)
Piston outer seal ring width	mm (in)	Standard	2.40 – 2.45 (0.0945 – 0.0965)
		Limit	2.20 (0.0866)
Piston inner seal ring width	mm (in)	Standard	2.30 – 2.35 (0.0906 – 0.0925)
		Limit	2.10 (0.0327)
Piston outer seal ring joint clearance	mm (in)	Standard	0.05 – 0.35 (0.0020 ~ 0.0138)
		Limit	1.0 (0.039)

Item			Service standard
Clutch			
Piston inner seal ring joint clearance	mm (in)	Standard	0.05 – 0.30 (0.0020 ~ 0.0118)
		Limit	1.0 (0.039)
Piston outer seal ring groove width	mm (in)	Standard	2.51 – 2.58 (0.0988 ~ 0.1016)
		Limit	2.7 (0.106)
Piston inner seal ring sliding portion diameter	mm (in)	Standard	40.20 – 40.25 (1.5829 – 1.5846)
		Limit	40.35 (1.5886)
Shaft tip end side seal ring sliding portion diameter (differential carrier inside diameter)	mm (in)	Standard	32.20 – 32.25 (1.2677 – 1.2699)
		Limit	32.35 (1.2736)
Torque converter side seal ring sliding portion diameter (transmission inside diameter)	mm (in)	Standard	35.20 – 35.25 (1.3858 – 1.3878)
		Limit	35.35 (1.3917)
Piston outer seal ring sliding portion diameter	mm (in)	Standard	122.0 – 122.05 (4.803 ~ 4.805)
		Limit	122.15 (4.8091)
Piston inner seal ring groove width	mm (in)	Standard	2.4 – 2.6 (0.094 – 0.102)
		Limit	2.7 (0.106)
Shaft seal ring groove width (3 places on the tip end side)	mm (in)	Standard	2.4 – 2.6 (0.094 – 0.102)
		Limit	2.7 (0.106)
Torque converter side seal ring groove width	mm (in	Standard	2.4 – 2.6 (0.094 – 0.102)
		Limit	2.7 (0.1061
Control valve			
Detent spring free length	mm (in)	Standard	17.96 (0.7071)
		Limit	17.70 (0.6969)
Inching spring free length	mm (in)	Standard	30.79 (1.2122)
		Limit	29.93 (1.1783)
Return spring free length	mm (in)	Standard	77 0 (3 031)
		Limit	75 16 (2 9591)
Inching spool outside diameter	mm (in)	Standard	13.973 – 14.00 (0.55012 – 0.5512)
		Limit	13.873 (0.546181
Clearance between inching spool and body	mm (in)	Standard	0.02 – 0.062 (0.0008 – 0.00244)
		Limit	0.10 (0.0039)
Accumulator spring (large diameter side) free length	mm (in)	Standard	128.44 (5.0567)
		Limit	127.31 (5.0122)
Accumulator spring (small diameter side) free length	mm (in)	Standard	154.06 (6.0654)
		Limit	152.85 (6.0177)
Clearance between accumulator piston and body	mm (in)	Standard	0.02 (0.062 (0.0008 – 0.00244)
		Limit	0.10 (0.0039)

Item			Service standard
Control valve			
Selector spool outside diameter	mm (in)	Standard	13.973–14.00 (0.5592~0.5512)
		Limit	13.873 (0.54613)
Clearance between selector spool and body	mm (in)	Standard	0.02 – 0.061 (0.0008 – 0.00240)
		Limit	0.10 (0.0039)

SST LIST

Illustration	SST part number	SST part name	Corresponding section			
			0			
	09090-04010	Engine sling device	○			
	09950-20017	Universal puller	○			
	09010-20111-71	Engine unit hanger	○			
	09220-22000-71	Torque converter clutch drum spring remover and replacer	○			